University of Pretoria Yearbook 2019

Faculty of Natural and Agricultural Sciences

Welcome to the Faculty of Natural and Agricultural Sciences

The hopes of South Africa rests, to a very large extent, on developments in Science, Engineering and Technology. The Faculty of Natural and Agricultural Sciences aims to provide leadership in the fields of basic natural sciences and mathematics. It has substantial records of research achievement. High quality of undergraduate and postgraduate education is offered and involvement in a variety of community projects contribute to excellence provided by the Faculty.

Faculty regulations and information

The rules for the degrees published here are subject to change and may be amended after the publication of this information.

The General Regulations (referred to as G.1-G.56) and General Rules apply to all faculties of the University of Pretoria. It is expected of all students to familiarise themselves well with these regulations and rules as well as all faculty-specific and programme-specific regulations and information as stipulated in the online yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression.

1. Examinations
Also consult General Regulations and Rules.

1.1 Examination admission and pass requirements

a. A final mark of at least 50% is required to pass the module.
b. Mainstream modules: A minimum semester mark of 30% is required to be admitted to the examination in a first-year, first-semester module on 100-level and a minimum semester/year mark of 40% is required for admission to the examination in all other modules.
c. Extended BSc (Four-year programme) modules: All students in the first two semesters of the extended BSc (Four-year programme) are allowed to write the examination in that module. In the third-semester modules a minimum semester mark of 30% is required for admission to the examination.
d. Class attendance is compulsory for all students in all modules for the full duration of all programmes. A student may be refused admission to the examination or promotion to a subsequent year of study if he/she fails to comply with the attendance requirements.
e. In certain modules, eg those with practical components, a department may stipulate additional requirements for students to be admitted to the examination. These requirements must be published in the study guide of the module. A student may be refused admission to the examination in a module by the head of the relevant department should the student not comply with these requirements.
f. In exceptional cases, where it is deemed appropriate, the Dean of the Faculty may excuse a student from attending all or a part of the activities in a module.

Please note: The requirements for admission to the examination is published in the study guide and the relevant department is required to inform students of the specific requirements at the beginning of each module.

1.2 Subminima in examinations
A subminimum of 40% is required in the examination in each module. The year or semester mark of a module is

obtained through continuous assessment of a student's performance during the module. A student must satisfactorily complete the practical component of the module (if applicable). The method by which the year/semester mark will be obtained, is published in the study guide of the module.

1.3 Examinations

The examinations for first-semester modules and the first- and second-quarter modules take place in May/June, while all other examinations (second-semester modules, third- and fourth-quarter modules and year modules) take place in October/November.

The final mark for the module is a combination of the year or semester mark and the examination mark, with the proviso that a module can only be passed if a subminimum of 40% is obtained in the examination and the practical component (if applicable) of the module has been satisfactorily completed. A final mark of at least 50% is required to pass a module. The year or semester mark must fall within a range of 40%-60% and the examination mark must fall within a range of 40%-60% of the final mark. Deviations from this rule can be approved by the Dean. The formula that is used to determine the final mark will be specified in the study guide of the module.

1.4 Ancillary examinations

After completion of an examination and before the examination results are published, the examiners may decide to summon a student for an ancillary examination on particular aspects of the work in that module with a view to determining:

- whether a candidate who does not comply with the requirements to pass a module could achieve a final pass mark; or
- whether a candidate, who does not comply with the requirements for a pass with distinction, will be able to improve his or her final mark.

It is, therefore, possible that, depending on the importance a lecturer attaches to continuous evaluation, no supplementary examinations may be awarded in a certain module.
If ancillary examinations are awarded in a module, the guidelines indicating the basis for such consideration, have to be published in the study guide of the module.

1.5 Re-marking of examination papers (also consult the G. Regulations)

After an examination, departments give feedback to students about the framework that was used by the examiners during the examination. The way in which feedback is given, is determined by the departmental heads. Students may apply for re-marking of an examination paper after perusal and within 14 calendar days after commencement of lectures in the next semester. The prescribed fee has to be paid. The paper will then be re-marked by an examiner appointed by the head of the department.

1.6 Supplementary examinations

a. Supplementary examinations in first-semester modules take place after the May/June examinations, while those in second-semester and year modules take place after the October/November examinations.
b. To pass a supplementary examination, a student must obtain a minimum of 50%.
c. The highest final percentage a student can obtain in a supplementary examination is 50%.
d. Special supplementary examinations are not arranged for students who are unable to write the examinations at the times and venues scheduled for supplementary examinations. (Also consult the G. Regulations.)

2. Special examinations in the Faculty of Natural and Agricultural Sciences

A student who requires a maximum of two modules and not more than 36 credits outstanding to comply with all the requirements for the degree, may be admitted by the Dean, on the recommendation of the head of department, to special examinations in modules failed, provided that this will enable him or her to comply with all the degree requirements. A student who has obtained a final mark of less than 40% in any one of the relevant

modules, or who has previously been admitted to a special examination, does not qualify for this concession.

3. Academic promotion requirements

General

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senate Appeals Committee: Admissions.
- Any decision taken by the Senate Appeals Committee: Admissions is final.

4. Recognition of excellence

Criteria for eligibility

To qualify for the awards the following criteria must be met:

(a) Dean's Merit List

The student will be considered if she/he has passed all first-time registered modules as prescribed for a programme at each year level of study for that year (minimum 140 credits per year)/88 credits for the first year of the BSc(Four-year Programme)) with a weighted average of 75%.

(b) Other achievers

The student will be considered if she/he has passed all first time registered modules as prescribed for a programme for that year (minimum 140 credits per year/88 credits for the first year of the BSc(Four-year Programme)) with a weighted average of 65%.

5. Requirements for specific modules

A candidate who:

a. passed the Grade 12 examination in Mathematics as well as in Physical Science with at least 60%, will be admitted to Molecular and Cell Biology and a module in the subjects Zoology and Entomology, Genetics, Microbiology or Plant Science;
b. who does not qualify for STK 110, must enrol for STK 113 and STK 123;
c. registers for Mathematical Statistics (WST) and Statistics (STK) modules must take note that WST and STK modules, except for STK 281, may not be taken simultaneously in a programme; and
d. registers for a module presented by another faculty must take note of the prerequisites for that module, subminimum required in examination papers, supplementary examinations, etc.

Please note:
'in the Grade 12 examination' refers to the final National Senior Certificate examination.

6. Academic information management (AIM 101/AIM 102 or AIM 111 and AIM 121)

It is compulsory for all new first-year students to take Academic information management modules. Please see curricula for details.

Faculty guidelines for consideration of BTech and/or MTech students to postgraduate study

Candidates who hold BTech and/or MTech degrees are required to fulfil the following conditions:

1. Honours level

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that the candidate wishes to pursue for an honours programme. The student will be given conditional acceptance to an honours programme, but in order to align the student's undergraduate training with the outcomes expected of a BSc graduate, the student will be expected to undertake additional coursework at NQF level 7. The head of department concerned will be required to identify specific modules. The programme of study must be recommended by the Postgraduate Studies Committee, Faculty Board and for approval by the Subcommittee of the Senate. Confirmation of candidature will be based on the successful completion of the additional module requirements during the first year of the honours programme.

1.1 Procedure

The candidate must submit an official application form, together with a motivation, matriculation certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications. The head of department has to identify and prescribe modules as set out in 1 above.

The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

Refer to the General Regulations.

2. Master's level

The candidate must have a BTech degree with a minimum of 60% in the broad area of specialisation that he/she wishes to pursue for a master's programme. The student will be given conditional acceptance to a master's programme, but in order to align the student's undergraduate training with the outcomes expected of a BScHons graduate, the student will be expected to undertake additional coursework at NQF levels 7 and 8. Additional coursework will be prescribed by the head of department concerned. A minimum of 70 credits at NQF level 8 will be required. The programme of study must be recommended by the Faculty Postgraduate Studies Committee, Faculty Board and for approval by the Subcommittee of the Senate. Confirmation of candidature will be based on the successfully completion of the additional module requirements during the first year of the master's programme.

2.1 Procedure

The candidate must submit an official application form, together with a motivation, matriculation certificate, academic record and a short CV. The CV should include details of relevant work experience and, where applicable, any publications. The head of department has to identify and prescribe modules as set out in 1 above.

The application is submitted via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

Refer to the General Regulations.

3. Doctoral level

The candidate must have an MTech degree and have obtained at least 60% for the MTech dissertation. Since the PhD is clearly more demanding of a wider (philosophical) scientific background, the selection of candidates for the PhD degree must be stringent, and could include outside evaluation of the dissertation work by nominees selected by the head of department and recommended by the Faculty Postgraduate Studies Committee, evidence of peer-reviewed publication, appropriate work-related experience (ie in a research environment) and, where necessary, formal coursework to address shortcomings in the academic background.

3.1 Procedure

The candidate must submit an official application form, together with a motivation, academic record, a copy of the MTech dissertation and a short CV. The CV should include details of appropriate work experience and list of any publications. The head of department will submit a motivation to support the application. The application is

submitted, via the Faculty Postgraduate Studies Committee and the Faculty Board, to the Subcommittee of the Senate for approval.

Refer to the General Regulations.

Senate of the University of Pretoria guidelines for Senate discretionary admissions

G.54 POLICY ON POSTGRADUATE STUDENT CASES AND THE RECOGNITION OF PRIOR LEARNING

As the University has a finite capacity in most undergraduate fields (its limits have already been reached or those admitted are selected from a large number of applicants), the University's policy on the recognition of prior learning only applies to student cases at postgraduate level (including postgraduate diplomas).

Furthermore, as the University's strategic objective is to be an internationally recognised research university, admission to postgraduate study by means of the recognition of a prior learning pathway is the exception rather than the rule.

Senate may –

a. grant a graduate of another higher education institution (either in the Republic or elsewhere) a status at the University that is equivalent to the status the student had at such other higher education institution.
b. admit a person, who

i. has passed examinations at another university or institution (either in the Republic or elsewhere) which Senate deems equivalent to, or higher than the examinations prescribed for a degree at the University, which are set as a prerequisite for admission to a particular postgraduate study programme, or for the admission of such a person as a research student; or
ii. in another manner has reached a standard of competence Senate considers adequate for the purposes of postgraduate study or research at the University, as a student for a postgraduate degree, diploma or certificate.

The regulation provides two alternative routes with regard to the admission of students at postgraduate level in cases where they do not comply with the prescribed requirements:

1. A first possibility is via the academic route where a student has proven himself/ herself on the basis of academic achievement.
2. The second possibility refers to a standard of competence that would make a student eligible to continue with postgraduate studies.

With regard to the viewpoint set out above candidates may, inter alia, be evaluated according to the following criteria:

Honours studies

1. In cases where only a diploma and not a degree programme was previously offered in a certain field of study, the Dean may, in consultation with the head of the department, consider the admission of such candidates.
2. Should a student have the necessary academic background, but did not graduate in the applicable field of study, he/she may be admitted to the honours degree on the grounds of:
3. the successful completion of an oral/written entrance examination; and
4. a submission to the Senate.

In certain cases one or more external examiners may evaluate such an application.

or

1. The academic merit of a student who has achieved a standard of competence in another manner can be evaluated by means of:

2. a written motivation by the student which is evaluated by the head of the department;
3. the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
4. a submission to the Senate.

Master's studies

1. The application of a student who is not in possession of the required honours degree which would admit him/her to study for the master's degree, but has an academically advanced background, may be considered on grounds of:
2. the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
3. a submission to the Senate.

or

1. In cases where a standard of competence was reached in another manner, status may be granted by means of:
2. a written motivation by the student which was compiled in conjunction with the head of the department and/or study supervisor, and a recommendation;
3. the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
4. a submission to the Senate.

Doctoral studies

1. The application of a student who is not in possession of the required master's degree which would admit him/her to doctoral study, but has an academically advanced background, may be considered on the grounds of:

- the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
- a submission to the Senate

or

2. In cases where a standard of competence was reached in another manner, status may be granted by means of:

- a written submission compiled in conjunction with the head of the department and/or study supervisor in which the standard of competence is indicated;
- a report by an external reference(s) motivating the merits of admission to doctoral study;
- the successful completion of an oral/written entrance examination in which one or more external examiners were involved; and
- a submission to the Senate.

Undergraduate Degree

BConSci Clothing Retail Management (02130110)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	4	D	**28**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Promotion to next study year

A student who did not pass all the prescribed modules of a particular year of study, has to register for the outstanding modules first. With the approval of the head of the department, modules of the following year of study may be taken in advance only if no timetable clashes occur; all the requirements and prerequisites have been met and not more than a specified number of credits per semester are taken. The credits of the semester of which modules are repeated, are taken as a guideline for the calculation of the number of modules permitted.

a. A student registers for the second year when at least 80% of the first-year module credits have been passed.
b. A student registers for the third year when at least 85% of the module credits of the previous years have been passed.
c. A student registers for the fourth year when at least 95% of the module credits of the previous years have been passed.

Practical/clinical/internship information

KTP 403 Experiential training in the industry: During the 4 years of study, during holidays, weekends and after hours, students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community projects/development, engage in service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of the department. These "credits" include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before

the degree will be conferred.

Pass with distinction

A student obtains his or her degree with distinction if a weighted average of at least 75% is obtained in the following modules:
A combination equivalent to six semester modules

- Marketing research 314 and Strategic marketing 321
- Clothing retail management 410 and Clothing merchandising 420
- Clothing production 320, Product development 411
- Project: Clothing textile project 402
- New developments, sustainability and textile use 411
- Textiles: Marketing and consumer aspects 421

Curriculum: Year 1

Minimum credits: 131

Minimum credits: 131
Fundamental = 12
Core = 119

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
Students who do not qualify for STK 110 must register for STK 113 and STK 123.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Marketing Management 120 (BEM 120) - Credits: 10.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Aesthetics 121 (EST 121) - Credits: 9.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Financial accounting 122 (FRK 122) - Credits: 12.00
Clothing production: sewing techniques 110 (KLR 110) - Credits: 9.00
Clothing production: processes 120 (KLR 120) - Credits: 9.00
Design principles 111 (OBG 111) - Credits: 7.00
Business management 114 (OBS 114) - Credits: 10.00
Business management 124 (OBS 124) - Credits: 10.00
Statistics 110 (STK 110) - Credits: 13.00

Curriculum: Year 2

Minimum credits: 137

Minimum credits: 137
Core = 137

Core modules
Consumer behaviour 212 (BEM 212) - Credits: 16.00
Integrated brand communications 224 (BEM 224) - Credits: 16.00
Informatics 282 (INF 282) - Credits: 3.00
Costume and fashion history 210 (KLD 210) - Credits: 12.00
Fashion forecasting 222 (KLD 222) - Credits: 12.00
Flat pattern design 211 (KLR 211) - Credits: 12.00
Pattern use and good fit 221 (KLR 221) - Credits: 10.00
Business management 210 (OBS 210) - Credits: 16.00
Business management 220 (OBS 220) - Credits: 16.00
Textiles: Utilities, fibres and yarns 212 (TKS 212) - Credits: 14.00
Textiles: Structures and finishes 222 (TKS 222) - Credits: 10.00

Curriculum: Year 3
Minimum credits: 120

Minimum credits: 120
Core = 120

Core modules
Marketing research 314 (BEM 314) - Credits: 20.00
Marketing management 321 (BEM 321) - Credits: 20.00
Business law 210 (BER 210) - Credits: 16.00
Business law 220 (BER 220) - Credits: 16.00
Aesthetics: Product, consumer and environment 320 (EST 320) - Credits: 8.00
Social and cultural aspects of clothing 311 (KLD 311) - Credits: 15.00
Clothing production 321 (KLR 321) - Credits: 17.00
Consumer facilitation 222 (VBF 222) - Credits: 8.00

Curriculum: Final year
Minimum credits: 122

Minimum credits: **122**
Core = 122

Additional information:
KTP 403 Experiential training in the industry: During the 4 years of study, during holidays, weekends and after hours, students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community projects/development, engage in service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of the department. These "credits" include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred.

Core modules
Clothing retail management 410 (KLD 410) - Credits: 20.00

Clothing merchandising 420 (KLD 420) - Credits: 20.00
Product development 411 (KLR 411) - Credits: 19.00
Experiential training in industry 403 (KTP 403) - Credits: 5.00
New developments, sustainability and textiles in use 411 (TKS 411) - Credits: 13.00
Textiles: marketing and consumer aspects 421 (TKS 421) - Credits: 15.00
Research project 400 (VBR 400) - Credits: 30.00

BConSci Food Retail Management (02130108)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	4	D	**28**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Promotion to next study year

A student who did not pass all the prescribed modules of a particular year of study, has to register for the outstanding modules first. With the approval of the head of the department, modules of the following year of study may be taken in advance only if no timetable clashes occur; all the requirements and prerequisites have been met and not more than a specified number of credits per semester are taken. The credits of the semester of which modules are repeated, are taken as a guideline for the calculation of the number of modules permitted.

a. A student registers for the second year when at least 80% of the first-year module credits have been passed.
b. A student registers for the third year when at least 85% of the module credits of the previous years have been passed.
c. A student registers for the fourth year when at least 95% of the module credits of the previous years have been passed.

Practical/clinical/internship information

OPI 400 (Experiential training in industry): During the first to fourth years of study students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in

community engagement and provide service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of department. These credits include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred.
Please note: Various practical and industry-interaction activities support the theoretical component of VDS 417 & VDS 427, VDS 413 and FST 412 and take place after hours to develop practical and industry skills.

Pass with distinction

A student obtains his or her degree with distinction if a weighted average of at least 75% is obtained in the following modules:
A combination equivalent to six semester modules:

- Marketing research 314 and Strategic marketing 321
- Food service management 420
- Consumer food research 310
- Food safety and hygiene 354
- Recipe development and standardisation 413
- Consumer aspects of food 417
- Food retailing and visual merchandising of food 427
- Food research project 480

Curriculum: Year 1

Minimum credits: 128

Minimum credits: 128

Fundamental = 12

Core = 116

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
Students who do not qualify for STK 110 must register for STK 113 and STK 123.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Marketing Management 120 (BEM 120) - Credits: 10.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Financial accounting 122 (FRK 122) - Credits: 12.00
Physiology 110 (FSG 110) - Credits: 6.00
Physiology 120 (FSG 120) - Credits: 6.00
Design principles 111 (OBG 111) - Credits: 7.00

Business management 114 (OBS 114) - Credits: 10.00
Business management 124 (OBS 124) - Credits: 10.00
Statistics 110 (STK 110) - Credits: 13.00
Basic food preparation 111 (VDS 111) - Credits: 6.00
Basic food preparation 121 (VDS 121) - Credits: 6.00

Curriculum: Year 2

Minimum credits: 127

Minimum credits: 127

Core = 127

Core modules

Consumer behaviour 212 (BEM 212) - Credits: 16.00
Integrated brand communications 224 (BEM 224) - Credits: 16.00
Business law 210 (BER 210) - Credits: 16.00
Business law 220 (BER 220) - Credits: 16.00
Informatics 282 (INF 282) - Credits: 3.00
Business management 210 (OBS 210) - Credits: 16.00
Consumer facilitation 222 (VBF 222) - Credits: 8.00
Food commodities and preparation 210 (VDS 210) - Credits: 18.00
Food commodities and preparation 221 (VDS 221) - Credits: 18.00

Curriculum: Year 3

Minimum credits: 135

Minimum credits: 135

Core = 135

Core modules

Labour relations 320 (ABV 320) - Credits: 20.00
Marketing research 314 (BEM 314) - Credits: 20.00
Marketing management 321 (BEM 321) - Credits: 20.00
Aesthetics: Product, consumer and environment 320 (EST 320) - Credits: 8.00
Nutrition 311 (VDG 311) - Credits: 17.00
Nutrition during life cycle 321 (VDG 321) - Credits: 17.00
Consumer food research 310 (VDS 310) - Credits: 21.00
Food safety and hygiene 354 (VDS 354) - Credits: 12.00

Curriculum: Final year

Minimum credits: 128

Minimum credits: 128

Core = 128

Additional information:

OPI 400 (Experiential training in industry): During the first to fourth years of study students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of department. These credits include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred. Please note: Various practical and industry-interaction activities support the theoretical component of VDS 417 & VDS 427, VDS 413 and FST 412 and take place after hours to develop practical and industry skills.

Core modules

Sensory evaluation 412 (FST 412) - Credits: 10.00
Experiential training in industry 400 (OPI 400) - Credits: 5.00
Research project 400 (VBR 400) - Credits: 30.00
Food service management 420 (VDB 420) - Credits: 21.00
Recipe development and standardisation 413 (VDS 413) - Credits: 30.00
Consumer aspects of food 417 (VDS 417) - Credits: 15.00
Food retailing and visual merchandising of food 427 (VDS 427) - Credits: 17.00

BConSci Hospitality Management (02130109)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	4	D	**28**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Promotion to next study year

A student who did not pass all the prescribed modules of a particular year of study, has to register for the outstanding modules first. With the approval of the head of the department, modules of the following year of

study may be taken in advance only if no timetable clashes occur; all the requirements and prerequisites have been met and not more than a specified number of credits per semester are taken. The credits of the semester of which modules are repeated, are taken as a guideline for the calculation of the number of modules permitted.

a. A student registers for the second year when at least 80% of the first-year module credits have been passed.
b. A student registers for the third year when at least 85% of the module credits of the previous years have been passed.
c. A student registers for the fourth year when at least 95% of the module credits of the previous years have been passed.

Practical/clinical/internship information

OPI 400 (Experiential training in industry): During the first to fourth years of study students must complete a total of 600 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x40 hours (120 hours) per year for the first to third year and 6 weeks x 40 hours in the fourth year to include event management, according to requirements as determine d by the head of department. These credits evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred. Please note: Various practical and industry interaction activities support the theoretical component of TBE 220, 310 and VDS 322,VDS 414 & 424 and take place after hours to develop practical and industry skills.

Pass with distinction

A student obtains his or her degree with distinction if a weighted average of at least 75% is obtained in the following modules:
A combination equivalent to six semester modules

- Tourism management 310
- Food research project 480
- Large-scale food production and restaurant management 322
- Recipe development and standardisation 413
- Culinary art 414, 424
- Food service management 420

Curriculum: Year 1

Minimum credits: 128

Minimum credits: 128

Core = 116

Fundamental = 12

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
Students who do not qualify for STK 110 must register for STK 113 and STK 123.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00

Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules
Marketing Management 120 (BEM 120) - Credits: 10.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Financial accounting 122 (FRK 122) - Credits: 12.00
Physiology 110 (FSG 110) - Credits: 6.00
Physiology 120 (FSG 120) - Credits: 6.00
Design principles 111 (OBG 111) - Credits: 7.00
Business management 114 (OBS 114) - Credits: 10.00
Business management 124 (OBS 124) - Credits: 10.00
Statistics 110 (STK 110) - Credits: 13.00
Basic food preparation 111 (VDS 111) - Credits: 6.00
Basic food preparation 121 (VDS 121) - Credits: 6.00

Curriculum: Year 2
Minimum credits: 128

Minimum credits: 128

Core = 128

Core modules
Labour relations 320 (ABV 320) - Credits: 20.00
Consumer behaviour 212 (BEM 212) - Credits: 16.00
Business law 210 (BER 210) - Credits: 16.00
Business management 210 (OBS 210) - Credits: 16.00
Business management 220 (OBS 220) - Credits: 16.00
Consumer facilitation 222 (VBF 222) - Credits: 8.00
Food commodities and preparation 210 (VDS 210) - Credits: 18.00
Food commodities and preparation 221 (VDS 221) - Credits: 18.00

Curriculum: Year 3
Minimum credits: 143

Minimum credits: 143

Core = 143

Core modules
Marketing research 314 (BEM 314) - Credits: 20.00
Aesthetics: Product, consumer and environment 320 (EST 320) - Credits: 8.00
Tourism and hospitality management 311 (TBE 311) - Credits: 20.00
Food service management 321 (VDB 321) - Credits: 18.00
Nutrition 311 (VDG 311) - Credits: 17.00

Nutrition during life cycle 321 (VDG 321) - Credits: 17.00
Large-scale food production and restaurant management 322 (VDS 322) - Credits: 31.00
Food safety and hygiene 354 (VDS 354) - Credits: 12.00

Curriculum: Final year

Minimum credits: 130

Minimum credits: 130

Core = 130

Additional information:

OPI 400 (Experiential training in industry): During the first to fourth years of study students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x40 hours (120 hours) per year for the first to third year and 6 weeks x 40 hours in the fourth year to include event management, according to requirements as determine by the head of department. These credits include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred. Please note: Various practical and industry interaction activities support the theoretical component of TBE 220, 310 and VDS 322,VDS 414 & 424 and take place after hours to develop practical and industry skills.

Core modules

Experiential training in industry 400 (OPI 400) - Credits: 5.00
Research project 400 (VBR 400) - Credits: 30.00
Food service management 420 (VDB 420) - Credits: 21.00
Recipe development and standardisation 413 (VDS 413) - Credits: 30.00
Culinary art 414 (VDS 414) - Credits: 22.00
Culinary art 424 (VDS 424) - Credits: 22.00

BSc Actuarial and Financial Mathematics (02133395)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	

5	C	7	A	**36**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Actuarial and Financial Mathematics), may be considered for admission to the BSc – Extended programme – Mathematical Sciences. This programme takes a year longer than the normal programmes to complete.

BSc – Extended programme – Mathematical Sciences Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	**28**

Admissions from the BSc - Extended programmes to the BSc (Actuarial and Financial Mathematics) programmes will only be considered if students have passed all their first-year modules with an average of at least 60%, passed IAS 111 and achieved a minimum percentage of 60% for WTW 143 and WTW 153.

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 144

Minimum credits: 144

Fundamental = 12
Core = 132

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial management 112 (FBS 112) - Credits: 10.00
Financial management 122 (FBS 122) - Credits: 10.00
Actuarial and Financial Mathematics in practice 111 (IAS 111) - Credits: 6.00
Actuarial and Financial Mathematics in practice 121 (IAS 121) - Credits: 6.00
Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 132
Elective = 12

Additional information:

- The elective must be chosen between IAS 282 or WTW 221.
- Students who want to follow an Actuarial career, should select IAS 282. Students who want to pursue an honours degree in Mathematics, should select WTW 221.

Core modules

Financial mathematics 211 (IAS 211) - Credits: 12.00
Contingencies 221 (IAS 221) - Credits: 12.00
Mathematical statistics 211 (WST 211) - Credits: 24.00
Applications in data science 212 (WST 212) - Credits: 12.00
Mathematical statistics 221 (WST 221) - Credits: 24.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Differential equations 264 (WTW 264) - Credits: 12.00

Elective modules

Financial mathematics 282 (IAS 282) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 108
Elective = 36

There are two options for electives. Students should select electives according to one of the options.

1. Actuarial Science option: IAS 353, IAS 382
Students who want to try to obtain the maximum possible exemptions from the Actuarial Society examinations, and who meet the prerequisites, should select the Actuarial Science option.

2. Financial Mathematics option: WTW 310, and one of the following modules WTW 320, WTW 382

Students who want to complete the BSc (Actuarial and Financial Mathematics) degree, but are considering an honours degree in Mathematics, should in addition to the Financial Mathematics option take the module WTW 381 for non-degree purposes.

Students who want to complete the BSc (Actuarial and Financial Mathematics) degree, but are considering an honours degree in Applied Mathematics, should take the Financial Mathematics option with any two of the modules WTW 382, WTW 383, WTW386, with one of them for non-degree purposes.

Students who want to complete the BSc (Actuarial and Financial Mathematics) degree, but are considering an honours degree in Mathematical Statistics, should take in addition to either option STK 353 for non-degree purposes.

Students who would like to continue with any of the alternative above-mentioned honours degrees without taking additional credits can switch to the respective undergraduate programme during their third year. Students should note that they still qualify for exemptions from the Actuarial Society subjects if they switch to one of the alternative degrees.

Core modules
Multivariate analysis 311 (WST 311) - Credits: 18.00
Stochastic processes 312 (WST 312) - Credits: 18.00
Time-series analysis 321 (WST 321) - Credits: 18.00
Actuarial statistics 322 (WST 322) - Credits: 18.00
Financial engineering 354 (WTW 354) - Credits: 18.00
Financial engineering 364 (WTW 364) - Credits: 18.00

Elective modules
Contingencies 353 (IAS 353) - Credits: 18.00
Survival models 382 (IAS 382) - Credits: 18.00
Analysis 310 (WTW 310) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00

BSc Applied Mathematics (02133253)

Minimum duration of study	3 years
Contact	Prof R Anguelov roumen.anguelov@up.ac.za +27 (0)124202520

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.

- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	6	B	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Applied Mathematics), may be considered for admission to the BSc – Extended programme for the Mathematical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc – Extended programme for the Mathematical Sciences Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	**26**

Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for

more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 138

Minimum credits: 138

Fundamental = 12 credits

Core = 96 credits

Elective = 30 credits

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Choose electives according to the following combinations with a view to pursuing specialisation in the relevant field:

Physics:	PHY 114 & PHY 124	(32 credits)
Chemistry:	CMY 117 & CMY 127	(32 credits)
Economics:	EKN 110, EKN 120 and one of FRK 111 or OBS 114 or FBS 112	(30 credits)

Students who want to take other electives must consult the undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

Elective modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial management 112 (FBS 112) - Credits: 10.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Business management 114 (OBS 114) - Credits: 10.00
First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 132

Minimum credits: 132

Core	=	84 credits
Elective	=	48 credits

Additional information:

Choose electives according to the following combinations with a view to pursuing specialisation in

the relevant field:

Physics:	PHY 255 & PHY 263	(48 credits)
Chemistry:	CMY 282, CMY 283, CMY 284 & CMY 285	(48 credits)
Economics:	EKN 214, EKN 224 & EKN 234	(48 credits)
Statistics:	WST 211 & WST 221	(48 credits)

Students who want to take other electives must consult the undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Core modules

Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Discrete structures 285 (WTW 285) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Economics 214 (EKN 214) - Credits: 16.00
Economics 224 (EKN 224) - Credits: 16.00
Economics 234 (EKN 234) - Credits: 16.00
Waves, thermodynamics and modern physics 255 (PHY 255) - Credits: 24.00
General physics 263 (PHY 263) - Credits: 24.00
Mathematical statistics 211 (WST 211) - Credits: 24.00
Mathematical statistics 221 (WST 221) - Credits: 24.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core	=	90 credits
Elective	=	54 credits

Additional information:

Students may choose elective modules from Physics, Chemistry, Economics, Mathematical Statistics, Mathematics and Financial Mathematics.

1. **Students who wish to pursue an honours degree in Physics** should take PHY 356 & PHY 364.
2. **Students who wish to pursue an honours degree in Chemistry** should take CMY 382, CMY 383 ,CMY 384 & CMY 385, with one of the modules for non-degree purposes.
3. **Students who wish to pursue an honours degree in Economics** should take EKN 310, EKN 320 & EKN 325
4. **Students who wish to pursue an honours degree in Mathematical Statistics** should take WST 311,

WST 312, WST 321, WST 322 & STK 353, with two of the modules for non-degree purposes.

5. **Students who wish to pursue an honours degree in Mathematics** should take WTW 381, WTW 320 & WTW 389.
6. **Students who wish to pursue an honours degree in Financial Mathematics** should take WTW 354 & WTW 364, and one module from WST 311, WST 312, WST 321 & WST 322.

Students who want to take other electives must consult the Undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Core modules

Analysis 310 (WTW 310) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00

Elective modules

Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Economics 310 (EKN 310) - Credits: 20.00
Economics 320 (EKN 320) - Credits: 20.00
Economics 325 (EKN 325) - Credits: 20.00
Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00
Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00
The science of data analytics 353 (STK 353) - Credits: 25.00
Multivariate analysis 311 (WST 311) - Credits: 18.00
Stochastic processes 312 (WST 312) - Credits: 18.00
Time-series analysis 321 (WST 321) - Credits: 18.00
Actuarial statistics 322 (WST 322) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Financial engineering 354 (WTW 354) - Credits: 18.00
Financial engineering 364 (WTW 364) - Credits: 18.00
Algebra 381 (WTW 381) - Credits: 18.00
Geometry 389 (WTW 389) - Credits: 18.00

BSc Biochemistry (02133398)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).

- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Biochemistry), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may

be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 144
Fundamental = 12
Core = 128

Note: Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intend applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the **second** semester of the first year.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144
Core = 120
Elective = 24

Additional information:
Dual major track:

- **Biochemistry and Chemistry combination:** Students must choose one elective per semester from BOT 251, BOT 261, FLG 211, FLG 212, FLG 221, FLG 222, MBY 251, MBY 261, MBY 262.
- **Biochemistry and Genetics combination:** Students must take MBY 251 and MBY 261.
- **Biochemistry and Human Physiology combination:** Students must replace [CMY 282, CMY 284, CMY 283, CMY 285] with [FLG 211, FLG 212, FLG 221, FLG 222]. Students must take MBY 251 and MBY 261.
- **Biochemistry and Microbiology combination:** Students must replace CMY 285 with MBY 262. Students must take MBY 251 and MBY 261.

- **Biochemistry and Plant Science combination:** Students must take BOT 251 and BOT 261.
- **Biochemistry and Zoology combination:** Students must replace [CMY 282, CMY 284, CMY 283, CMY 285] with [BOT 251, ZEN 251, BOT 261, ZEN 261]. Students must take MBY 251 and MBY 261.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00

Elective modules

South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144
Core = 72
Elective = 72

Dual major track:

- **Biochemistry and Chemistry combination:** Students must take CMY 382, CMY 383, CMY 384 and CMY 385.
- **Biochemistry and Genetics combination:** Students must take GTS 351, GTS 354, GTS 367 and [GTS368 or BTC 361].
- **Biochemistry and Human Physiology combination:** Students must take FLG 327, FLG 330, FLG 331 and FLG 332.
- **Biochemistry and Microbiology combination:** Students must take MBY 351, MBY 355, MBY 364 and MBY 365.
- **Biochemistry and Plant Science combination:** Students must take BOT 356, BOT 358, BOT 365 and BOT 366.
- **Biochemistry and Zoology combination:** Students must take ZEN 352, ZEN 354, ZEN 361 and ZEN 363.

Core modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00

Elective modules

Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Higher neurological functions 327 (FLG 327) - Credits: 18.00
Cellular and developmental physiology 330 (FLG 330) - Credits: 18.00
Exercise and nutrition science 331 (FLG 331) - Credits: 18.00
Applied and pathophysiology 332 (FLG 332) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00
Mammalogy 352 (ZEN 352) - Credits: 18.00
Evolutionary physiology 354 (ZEN 354) - Credits: 18.00
Physiological processes 361 (ZEN 361) - Credits: 18.00
Behavioural ecology 363 (ZEN 363) - Credits: 18.00

BSc Biological Sciences (02133397)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements
Achievement level

English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Biological Sciences), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the

content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 128

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students who intend on applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the second semester of the first year.

Students intending to apply for the **BVSc** selection have to enrol for MTL 180(12).

Please note: ANA modules can only be taken by **BSc (Medical Science)** students.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00

Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

BSc Biotechnology (02133403)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Biotechnology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.

- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140
Fundamental = 12
Core = 128

Additional information: Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144
Core = 108
Elective = 36

Additional information:

Electives may be chosen from BCM 262, BME 210, DAF 200, FST 250, GKD 250, MBY 262, PLG 251, PLG 262, PPK 251, ZEN 251, ZEN 261 or other module/s subject to permission from the HOD.

Please note:

- Students who want to focus their degree in Biochemistry must take BCM 262.
- Students who want to focus their degree in Microbiology must take MBY 262.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00

Elective modules

Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Biometry 210 (BME 210) - Credits: 24.00
Animal anatomy and physiology 200 (DAF 200) - Credits: 32.00
Introduction to food science and technology 250 (FST 250) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum Credits: 144
Core = 54
Elective = 90

To focus your degree in Biochemistry:

- Students must take BCM 357, BCM 367, BCM 368.
- The balance of the electives (36 credits) must be chosen from BOT 365, GTS 354, GTS 367, GTS 368, MBY 351, MBY 355, MBY 365.

To focus your degree in Genetics:

- Students interested in the PLANT GENETICS option must take GTS 354, BTC361, GTS367.
- The balance of the electives (36 credits) must be chosen from BCM367, BOT 356, BOT 358, BOT 365, PLG 351, PLG 363.
- Students interested in the HUMAN / ANIMAL GENETICS option must take GTS 354, GTS 367, GTS368.
- The balance of the electives (36 credits) must be chosen from BCM 357, BCM 367, BCM 368, MBY 351, MBY

355, MBY 365.

To focus your degree in Microbiology:

- Students must take MBY 351, MBY 355, MBY 365.
- The balance of the electives (36 credits) must be chosen from BCM 367, BCM 368, BOT 365, BTC 361, GTS 367.

To focus your degree in Plant Science:

- Students must take BTC 361, BOT 365.
- The balance of the electives (54 credits) must be chosen from BCM 367, BOT 356, BOT 358, BOT 366, GTS 354, GTS 367, MBY 351, MBY 365, PLG 363.

Core modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00

Elective modules

Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00
General plant pathology 351 (PLG 351) - Credits: 18.00
Plant disease control 363 (PLG 363) - Credits: 18.00

BSc Chemistry (02133173)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**34**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Chemistry), may be considered for admission to the BSc – Extended programme – Physical Sciences. This programme takes a year longer than the normal programmes to complete.

BSc – Extended Programme – Physical Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**28**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 96
Electives = 32

Elective Modules (Credits = 32)
Students must select elective modules with a total number of at least 32 credits.

Depending on a student's second major and other interests, the following combinations of modules are recommended (deviations allowed with permission from the head of department):

- Second major in biochemistry: MLB 111, GTS 161, MBY 161 or BME 120 (32 credits)
- Second major in plant science: MLB 111, BOT 161, MBY 161 or BME 120 (32 credits)
- Second major in geology: GLY 155, GLY 163 (32 credits)
- Second major in physics with an interest in applied mathematics: WTW 115, WTW 152, WTW 162, WTW 123 (32 credits)
- Second major in physics with an interest in statistics: WST 111, WST 121 (32 credits)
- Second major in physics with an interest in biology: MLB 111, BME 120 (32 credits)
- Second major in geography: ENV 101, GGY 156, GGY 166, WKD 164 (32 credits)
- Second major in mathematics: WTW 115, WTW 123, WTW 152, WTW 162 (32 credits)
- Second major in statistics: WST 111, WST 121 (32 credits)

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Mathematics 124 (WTW 124) - Credits: 16.00

Elective modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Atmospheric structure and processes 155 (WKD 155) - Credits: 16.00
Climate and weather of Southern Africa 164 (WKD 164) - Credits: 8.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core	=	48
Elective	=	96

Additional information:
Elective Modules (Credits = 96)

Students must select elective modules with a total number of at least 96 credits.
Depending on a student's second major and other interests, the following modules are recommended (deviations allowed with permission from the head of department):

- Second major in biochemistry: BCM 251, BCM 252, BCM 261, BCM 262, GTS 251, GTS 261, MBY 251 or WTW 211,
- Second major in plant science: BOT 251, BOT 261, MBY 251, MBY 261, BCM 251, BCM 252, and either BCM 261 or BCM 262 Second major in physics: PHY 255, PHY 263, WTW 211, WTW 218, WTW 220, WTW 248
- Second major in geology: GLY 253, GLY 255, GLY 261, GLY 262, GLY 266, GGY 252, GKD 22, GIS 221 Second major in geography: GGY 252, GGY 283, GGY 266, GKD 220, GIS 220, and either GLY 253 or GLY 255 (GMC 110 a prerequisite).
- Second major in mathematics with an interest in physics: WTW 211, WTW 218, WTW 220, WTW 221, PHY 255, PHY 263 (96 credits).
- Second major in physics: WTW 211, WTW 218, WTW 220, WTW 248, PHY 255, PHY 263 (96 credits)
- Second major in mathematics or applied mathematics: WTW 211, WTW 218, WTW 220, WTW 221, WTW 285, WTW 286, WTW 248 (84 credits – select another 12 credits short).
- Second major in statistics: WST 211, WST 221, WTW 211, WTW 218, WTW 220, WTW 221 (96 credits)

Core modules
Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00

Elective modules
Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00

Linear algebra 221 (WTW 221) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Discrete structures 285 (WTW 285) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core	=	72
Elective	=	72

Students must select elective modules with a total number of at least 72 credits.

Depending on a student's second major and other interests, the following modules are recommended (deviations allowed with permission from the head of department):

- Second major in biochemistry: BCM 356, BCM 357, BCM 367, BCM 368 (72 credits)
- Second major in plant science: BOT 356, BOT 358, and any two of BOT 365, BOT 366 and BTC 361 (72 credits).
- Second major in physics: PHY 356, PHY 364 (72 credits).
- Second major in geology: GLY365, GLY366, GLY367, GLY 368 (78 credits).
- Second major in geography: ENV 301, GGY 356, GGY 363, GGY 366 (66 credits – 6 credits short). Note that in order to qualify for BSc Honours in Geography, students need to change their registration to BSc Geography at the start of the third year to replace core chemistry modules with additional Geography modules.
- Second major in mathematics: WTW 310, WTW 320, WTW 381 and WTW 389 (72 credits).
- Second major in applied mathematics: WTW 310, WTW 382, WTW 383, WTW 386 and WTW 387 (90 credits – 18 credits extra).
- Second major in statistics: WST 311, WST 312, WST 321, STK 353 (79 credits)

Core modules

Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00

Elective modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Sustainable development 356 (GGY 356) - Credits: 18.00
Applied geomorphology 363 (GGY 363) - Credits: 12.00
Development frameworks 366 (GGY 366) - Credits: 18.00
Geographic information systems 310 (GIS 310) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Geometry 389 (WTW 389) - Credits: 18.00

BSc Culinary Science (02133320)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Culinary Science), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-

year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Practical/clinical/internship information

OPI 400 (Experiential training in industry): During the first to fourth years of study, students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of department. These “credits” include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred. Please note: Various practical and industry interaction activities support the theoretical component of VDS 414 & VDS 424, VDS 413 and FST 413 and take place after hours to develop practical and industry skills.

Pass with distinction

A student obtains his or her degree with distinction if a weighted average of at least 75% is obtained in the following modules:

Recipe development and standardisation 413

Consumer aspects of food 417

Food research project 480

Food service management 420

Food science and technology 413

Curriculum: Year 1

Minimum credits: 134

Minimum credits: 134

Core = 122 credits

Fundamental = 12

Note: Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Marketing Management 120 (BEM 120) - Credits: 10.00
Biometry 120 (BME 120) - Credits: 16.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Physiology 110 (FSG 110) - Credits: 6.00
Physiology 120 (FSG 120) - Credits: 6.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Basic food preparation 111 (VDS 111) - Credits: 6.00
Basic food preparation 121 (VDS 121) - Credits: 6.00

Mathematics 134 (WTW 134) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits:

Core = 144

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Consumer behaviour 212 (BEM 212) - Credits: 16.00
Principles of food processing and preservation 260 (FST 260) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Consumer facilitation 222 (VBF 222) - Credits: 8.00
Food commodities and preparation 210 (VDS 210) - Credits: 18.00
Food commodities and preparation 221 (VDS 221) - Credits: 18.00

Curriculum: Year 3

Minimum credits: 140

Minimum credits:

Core = 140

Core modules

Food chemistry 351 (FST 351) - Credits: 18.00
Food chemistry (2) 352 (FST 352) - Credits: 18.00
Food service management 321 (VDB 321) - Credits: 18.00
Nutrition 311 (VDG 311) - Credits: 17.00
Nutrition during life cycle 321 (VDG 321) - Credits: 17.00
Consumer food research 310 (VDS 310) - Credits: 21.00
Large-scale food production and restaurant management 322 (VDS 322) - Credits: 31.00

Curriculum: Final year

Minimum credits: 140

Minimum credits:

Core = 140 credits

Additional information:

OPI 400 (Experiential training in industry): During the first to fourth years of study, students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x 40 hours (120 hours) per year,

according to requirements as determine by the head of department. These “credits” include evidence of experiential training, service learning and community engagement during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred. Please note: Various practical and industry interaction activities support the theoretical component of VDS 414 & VDS 424, VDS 413 and FST 413 and take place after hours to develop practical and industry skills.

Core modules

Sensory evaluation 412 (FST 412) - Credits: 10.00
Experiential training in industry 400 (OPI 400) - Credits: 5.00
Research project 400 (VBR 400) - Credits: 30.00
Food service management 420 (VDB 420) - Credits: 21.00
Recipe development and standardisation 413 (VDS 413) - Credits: 30.00
Culinary art 414 (VDS 414) - Credits: 22.00
Culinary art 424 (VDS 424) - Credits: 22.00

BSc Ecology (02133400)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Ecology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Electives are chosen as follows:

Second year – 12 credits

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00

General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 132

Elective = 12

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Elective modules

Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 144

Core modules

Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00

Population ecology 351 (ZEN 351) - Credits: 18.00
Community ecology 353 (ZEN 353) - Credits: 18.00
Physiological processes 361 (ZEN 361) - Credits: 18.00
Evolution and phylogeny 362 (ZEN 362) - Credits: 18.00
Conservation ecology 364 (ZEN 364) - Credits: 18.00

BSc Engineering and Environmental Geology (02133043)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Engineering and Environmental Geology), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.

- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits:

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Student wishing to take second-year Mathematics or Applied Mathematics modules to complement the Mechanics modules, must take WTW 114 and WTW 124 instead of WTW 158 and WTW 164

Students who wishes to register **GIS 220** in the second year have to register **GMC 110** in the first year

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
First course in physics 114 (PHY 114) - Credits: 16.00
Mechanics 122 (SWK 122) - Credits: 16.00
Calculus 158 (WTW 158) - Credits: 16.00
Mathematics 164 (WTW 164) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 142

Minimum credits: 142

Core = 94

Elective = 48

Additional information:

A block of 48 elective credits must be selected from the following-

Chemistry: CMY 282, CMY 283, CMY 284, CMY 285 (48 credits)

Mathematics: WTW 211, WTW 218, WTW 220, WTW 221 (48 credits)

Applied Mathematics: WTW 211, WTW 218, WTW 248, WTW 286 (48 credits)

GIS/Geomorphology: GGY 252, GIS 220, GGY 266 (48 credits)

Core modules

Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Sedimentology 253 (GLY 253) - Credits: 12.00
Fundamental and applied mineralogy 255 (GLY 255) - Credits: 12.00
Igneous petrology 261 (GLY 261) - Credits: 12.00
Metamorphic petrology 262 (GLY 262) - Credits: 12.00
Geological field mapping 266 (GLY 266) - Credits: 6.00
Strength of materials 210 (SWK 210) - Credits: 16.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Process geomorphology 252 (GGY 252) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year

Minimum credits: 138

Minimum credits:138

Core = 122

Elective = 16

Additional information:

Either GLY 367 (24 credits) or SGM 323 (16 credits) must be taken in the second semester.

Core modules

Soil chemistry 320 (GKD 320) - Credits: 14.00
Soil classification and surveying 350 (GKD 350) - Credits: 14.00
Engineering geology 363 (GLY 363) - Credits: 18.00
Rock mechanics 364 (GLY 364) - Credits: 18.00
Structural geology 365 (GLY 365) - Credits: 18.00
Groundwater 366 (GLY 366) - Credits: 18.00
Advanced Geological field mapping 368 (GLY 368) - Credits: 6.00
Soil mechanics 311 (SGM 311) - Credits: 16.00

Elective modules

Structural geology 365 (GLY 365) - Credits: 18.00
Economic geology 367 (GLY 367) - Credits: 36.00
Geotechnical engineering 323 (SGM 323) - Credits: 16.00

BSc Entomology (02133401)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Entomology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study,

retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00

Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 132

Elective = 12

Additional information:

• Students interested in combining with Entomology in a dual major with Biochemistry or Genetics must take BCM 261 as an elective.
• Students interested in combining Entomology in a dual major with Biochemistry must also replace either BOT 261 or MBY 261 with BCM 262.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 144

Additional information:

Single major track
Option to replace ZEN 361 with ZEN 363. In addition, students must take all the seven modules listed in the fixed curriculum for the final year.

Dual major track
• **Entomology and Biochemistry combination:** Students must take [ZEN 354 + ZEN 355] and [ZEN361 + ZEN 365] and to a total value of 72 credits, and must take [BCM 356 and BCM 357] and [BCM 367 and BCM 368].

• **Entomology and Genetics combination:** Students must take [ZEN 354 + ZEN 355] and [ZEN 361 + ZEN 365] to a total value of 72 credits, and must take [GTS 351 and GTS 354] and [GTS 367 and either BTC 361 or GTS 368] to a value of 72 credits.
• **Entomology and Plant Science combination:** Students must take [ZEN 354 + ZEN 355] and [ZEN 362 + ZEN 365] to a total value of 72 credits, and must take [BOT 356 and BOT 358] and [BOT 366 and either BOT 365

or BTC 361] to a value of 72 credits.

Core modules

Population ecology 351 (ZEN 351) - Credits: 18.00
Community ecology 353 (ZEN 353) - Credits: 18.00
Evolutionary physiology 354 (ZEN 354) - Credits: 18.00
Insect diversity 355 (ZEN 355) - Credits: 18.00
Physiological processes 361 (ZEN 361) - Credits: 18.00
Evolution and phylogeny 362 (ZEN 362) - Credits: 18.00
Conservation ecology 364 (ZEN 364) - Credits: 18.00
Applied entomology 365 (ZEN 365) - Credits: 18.00

BSc Environmental Sciences (02133362)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Environmental Sciences), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study,

retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students can take WTW 114 instead of WTW 134 if they meet the entry requirement.

No elective credits are required. However depending on a student's second major or theme, the following combinations of modules are recommended:

- **Chemistry as a second major:** WTW 114 instead of WTW 134
- **Ecology as a theme:** GMC 110
- **Geography as a second major:** GMC 110
- **Geoinformatics as a theme:** GMC 110

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00

Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to environmental sciences 101 (ENV 101) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Climate and weather of Southern Africa 164 (WKD 164) - Credits: 8.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 84

Elective = 60

Additional information:

Students are advised to select elective modules based on the requirements for a second major or a theme of interest. Further electives may then be selected to complete the required number of credits. It is the student's responsibility to ensure that all prerequisites are taken into account. The prerequisites for each module are listed in its yearbook entry. Second majors (leading to honours studies) that may be combined with Environmental Science are Geography or Chemistry. GIS or Ecology could form synergic themes (not leading to honours) with Environmental Science.

Students must select elective modules with a total number of at least 60 credits. Depending on a student's second major and other interests, the following modules are recommended:

- **Chemistry as a second major:** CMY 282, CMY 283, CMY 284, CMY 285 (Credits 48)
- **Ecology as a theme:** GGY 283, PPK 251, GMA 220, LEK 210 (Credits 55)
- **Geography as second major:** GMA 220, GGY283, GGY 266, (Credits 52)
- **Geoinformatics as a theme:** GMA 220, GGY 283, INF 214, GIS 220 (Credits 56)

Core modules

South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Process geomorphology 252 (GGY 252) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00

Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Introductory geographic information systems 283 (GGY 283) - Credits: 14.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Informatics 214 (INF 214) - Credits: 14.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00
Physical meteorology 261 (WKD 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 36

Elective = 108

Students must select elective modules with a total number of at least 108 credits. Depending on a student's second major and other interests, the following modules are recommended.

- **Chemistry as a second major**: CMY 382, CMY 383, CMY 384, CMY 385 (Credits 72)
- **Ecology as theme:** GIS 310, BOT 358, BOT 366, ZEN 351, ZEN 353, ZEN 362, ZEN 364 (Credits 112)
- **Geography as a second major:** GMA 320, GGY 356, GGY 366 (Credits 58)
- **Geoinformatics as theme:** GIS 310, GIS 320, GMA 320 (66 Credits)

Core modules

Human environmental interactions 301 (ENV 301) - Credits: 18.00
Environmental geomorphology 361 (GGY 361) - Credits: 18.00

Elective modules

Plant ecology 358 (BOT 358) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Sustainable development 356 (GGY 356) - Credits: 18.00
Development frameworks 366 (GGY 366) - Credits: 18.00
Geographic information systems 310 (GIS 310) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00
Soil classification and surveying 350 (GKD 350) - Credits: 14.00
Remote sensing 320 (GMA 320) - Credits: 22.00
Population ecology 351 (ZEN 351) - Credits: 18.00
Community ecology 353 (ZEN 353) - Credits: 18.00
Behavioural ecology 363 (ZEN 363) - Credits: 18.00
Conservation ecology 364 (ZEN 364) - Credits: 18.00

BSc Extended programme - Biological and Agricultural Sciences (02130014)

Minimum duration of study	4 years

Admission requirements

Candidates who do not comply with the minimum admission requirements of programmes in the Department of Biological Sciences, may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Additional requirements

a. Students who are admitted to one of the BSc four-year programmes register for one specific programme. Three extended programmes are available:

- BSc (Four-year programme) – Mathematical Sciences
- BSc (Four-year programme) – Biological and Agricultural Sciences
- BSc (Four-year programme) – Physical Sciences

b. These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
c. Students who do not comply with the normal three-year BSc entrance requirements for study in the Faculty of Natural and Agricultural Sciences, may nevertheless be admitted to the Faculty by being placed on the BSc (Four-year programme). Generally the BSc (Four-year programme) means that the first study year in Mathematics, Physics, Biology and Chemistry is extended to take two years. After completing the BSc (Four-year programme) successfully, students join the second year of the normal BSc programme to complete their degrees. The possibility of switching over to other faculties such as Engineering, Built Environment and Information Technology, Veterinary Science and Health Sciences, after one or two years in the four-year programme, exists. This depends on selection rules and other conditions stipulated by the other faculties.
d. Students who wish to follow one of the BSc four-year programmes will be subjected to an Institutional Proficiency Test and will be considered for admission by the Admissions Committee. Information in this regard is available at the Client Services Centre.
e. Applications for admission to the BSc (Four-year programme) should be submitted before 30 September each year. Details are obtainable from the Student Administration at the Faculty of Natural and Agricultural Sciences.

f. The rules and regulations applicable to the normal study programmes apply mutatis mutandis to the BSc (Four-year programme), with exceptions as indicated in the regulations pertaining to the BSc (Four-year programme). For instance, students placed in the BSc (Four-year programme) must have a National Senior Certificate with admission for degree purposes.
g. An admissions committee considers applications for the BSc (Four-year programme) annually. Regarding subject choices, admitted students are individually placed on the BSc (Four-year programme) according to their prospective field of study. Students may NOT change this placement without the permission of the Chairperson of the admissions committee.

Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the alphabetical list of modules.

Promotion to next study year

Academic promotion requirements
It is expected of students who register for the first year of the BSc (Four-year programme) to pass all the prescribed modules of the first year.
It is expected of students accepted into the BSc (Four-year programme) to finish a complete corresponding BSc first year within the two years of enrolment in the BSc (Four-year programme). Students who do not show progress during the first semester of the first year will be referred to the Admissions Committee of the Faculty.

Curriculum: Year 1

Minimum credits: 88

Minimum credits: 88

Fundamental = 24

Core = 64

NB Students may register for an extended programme module only once.

Fundamental modules

Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language, life and study skills 133 (LST 133) - Credits: 8.00
Language, life and study skills 143 (LST 143) - Credits: 8.00
Academic orientation 120 (UPO 120) - Credits: 0.00

Core modules

Chemistry 133 (CMY 133) - Credits: 8.00
Chemistry 143 (CMY 143) - Credits: 8.00
Molecular and cell biology 133 (MLB 133) - Credits: 8.00

Molecular and cell biology 143 (MLB 143) - Credits: 8.00
Physics 133 (PHY 133) - Credits: 8.00
Physics 144 (PHY 144) - Credits: 8.00
Precalculus 133 (WTW 133) - Credits: 8.00
Mathematics 144 (WTW 144) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 32

Minimum credits:

Core = 32

Elective = According to BSc programme of choice

Additional information:

Students must register for the applicable third-semester modules(second year, first semester) and the second-semester, modules must be selected from the normal BSc programme of the student's choice.

Equivelent modules:

Chemistry extended modules: CMY 133, CMY 143 and CMY 154: Equivelent to BSc module CMY 117

Molecular and cell biology extended modules: MLB 133, MLB 143 and MLB 153: Equivelent to BSc module MLB 111

Physics extended modules: PHY 133, PHY 143 and PHY 154: Equivelent to BSc module PHY 131

Mathematics extended modules: WTW 133, WTW 143 and WTW 154: Equivelent to BSc module WTW 134

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 127 (CMY 127) - Credits: 16.00
Chemistry 154 (CMY 154) - Credits: 8.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 153 (MLB 153) - Credits: 8.00
Physics 154 (PHY 154) - Credits: 8.00
Mathematics 154 (WTW 154) - Credits: 8.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Elective modules

Introduction: Human anatomy and embryology 121 (ANA 121) - Credits: 4.00
Human osteology 122 (ANA 122) - Credits: 4.00
Basic human histology 126 (ANA 126) - Credits: 4.00
Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 127 (CMY 127) - Credits: 16.00
Science and world views 155 (FIL 155) - Credits: 6.00
Financial accounting 111 (FRK 111) - Credits: 10.00

Financial accounting 121 (FRK 121) - Credits: 12.00
Physiology 110 (FSG 110) - Credits: 6.00
Physiology 120 (FSG 120) - Credits: 6.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Psychology 110 (SLK 110) - Credits: 12.00
Psychology 120 (SLK 120) - Credits: 12.00
Basic food preparation 121 (VDS 121) - Credits: 6.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

BSc Extended programme - Mathematical Sciences (02130016)

Minimum duration of study	4 years

Admission requirements

?Candidates who do not comply with the minimum admission requirements of programmes in the Department of Mathematical Sciences, may be considered for admission to the BSc – Extended programme for the Mathematical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc – Extended programme for the Mathematical Sciences Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	**26**

Additional requirements

a. Students who are admitted to one of the BSc four-year programmes register for one specific programme. Three extended programmes are available:

- BSc (Four-year programme) – Mathematical Sciences
- BSc (Four-year programme) – Biological and Agricultural Sciences
- BSc (Four-year programme) – Physical Sciences

b. These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
c. Students who do not comply with the normal three-year BSc entrance requirements for study in the Faculty of Natural and Agricultural Sciences, may nevertheless be admitted to the Faculty by being placed on the BSc (Four-year programme). Generally the BSc (Four-year programme) means that the first study year in Mathematics, Physics, Biology and Chemistry is extended to take two years. After completing the BSc (Four-year programme) successfully, students join the second year of the normal BSc programme to complete their degrees. The possibility of switching over to other faculties such as Engineering, Built Environment and Information Technology, Veterinary Science and Health Sciences, after one or two years in the four-year programme, exists. This depends on selection rules and other conditions stipulated by the other faculties.
d. Students who wish to follow one of the BSc four-year programmes will be subjected to an Institutional

Proficiency Test and will be considered for admission by the Admissions Committee. Information in this regard is available at the Client Services Centre.

e. Applications for admission to the BSc (Four-year programme) should be submitted before 30 September each year. Details are obtainable from the Student Administration at the Faculty of Natural and Agricultural Sciences.
f. The rules and regulations applicable to the normal study programmes apply mutatis mutandis to the BSc (Four-year programme), with exceptions as indicated in the regulations pertaining to the BSc (Four-year programme). For instance, students placed in the BSc (Four-year programme) must have a National Senior Certificate with admission for degree purposes.
g. An admissions committee considers applications for the BSc (Four-year programme) annually. Regarding subject choices, admitted students are individually placed on the BSc (Four-year programme) according to their prospective field of study. Students may NOT change this placement without the permission of the Chairperson of the admissions committee.

Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the alphabetical list of modules.

Promotion to next study year

Academic promotion requirements
It is expected of students who register for the first year of the BSc (Four-year programme) to pass all the prescribed modules of the first year.
It is expected of students accepted into the BSc (Four-year programme) to finish a complete corresponding BSc first year within the two years of enrolment in the BSc (Four-year programme). Students who do not show progress during the first semester of the first year will be referred to the Admissions Committee of the Faculty.

Curriculum: Year 1

Minimum credits: 88

Minimum credits:

Fundamental = 24

Core = 32

Elective = 32

Additional information:

Students register for either one of the following elective combinations

- First semester PHY133 and CMY133, second semester PHY143 and CMY143
- First semester FRK133 and OBS133, second semester FRK143 and OBS143.

NB Students may register for an extended module only once.

Fundamental modules

Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language, life and study skills 133 (LST 133) - Credits: 8.00
Language, life and study skills 143 (LST 143) - Credits: 8.00
Academic orientation 120 (UPO 120) - Credits: 0.00

Core modules

Mathematical statistics 133 (WST 133) - Credits: 8.00
Mathematical statistics 143 (WST 143) - Credits: 8.00
Precalculus 133 (WTW 133) - Credits: 8.00
Calculus 143 (WTW 143) - Credits: 8.00

Elective modules

Chemistry 133 (CMY 133) - Credits: 8.00
Chemistry 143 (CMY 143) - Credits: 8.00
Financial accounting 133 (FRK 133) - Credits: 8.00
Financial accounting 143 (FRK 143) - Credits: 8.00
Business management 133 (OBS 133) - Credits: 8.00
Business management 143 (OBS 143) - Credits: 8.00
Physics 133 (PHY 133) - Credits: 8.00
Physics 143 (PHY 143) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 28

Minimum credits:

Core = 16

Elective = According to BSc programme of choice

Additional information:

Possible third semester electives: CMY 154, PHY 153

Students must register for the applicable third-semester modules(second year, first semester) and the second-semester, modules must be selected from the normal BSc programme of the student’s choice.

Equivalent modules:

Chemistry extended modules: CMY 133, CMY 143 and CMY 154: Equivalent to BSc module CMY 117

Physics extended modules: PHY 133, PHY 143 and PHY 153: Equivalent to BSc module PHY 114

Mathematics extended modules: WTW 133, WTW 143 and WTW 153: Equivalent to BSc module WTW 114

Mathematical Statistics extended modules: WST 133, WST 143 and WST 153: Equivalent to BSc module WST 111

Core modules
Mathematical statistics 153 (WST 153) - Credits: 8.00
Calculus 153 (WTW 153) - Credits: 8.00

Elective modules
Chemistry 154 (CMY 154) - Credits: 8.00
Program design: Introduction 110 (COS 110) - Credits: 16.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 113 (EKN 113) - Credits: 15.00
Economics 120 (EKN 120) - Credits: 10.00
Economics 123 (EKN 123) - Credits: 15.00
Financial management 112 (FBS 112) - Credits: 10.00
Financial management 122 (FBS 122) - Credits: 10.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Physics 153 (PHY 153) - Credits: 8.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

BSc Extended programme - Physical Sciences (02130015)

Minimum duration of study	4 years

Admission requirements

Candidates who do not comply with the minimum admission requirements of programmes in the Department of Physical Sciences, may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences						
Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Additional requirements

a. Students who are admitted to one of the BSc four-year programmes register for one specific programme. Three extended programmes are available:

- BSc (Four-year programme) – Mathematical Sciences
- BSc (Four-year programme) – Biological and Agricultural Sciences

- BSc (Four-year programme) – Physical Sciences

b. These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
c. Students who do not comply with the normal three-year BSc entrance requirements for study in the Faculty of Natural and Agricultural Sciences, may nevertheless be admitted to the Faculty by being placed on the BSc (Four-year programme). Generally the BSc (Four-year programme) means that the first study year in Mathematics, Physics, Biology and Chemistry is extended to take two years. After completing the BSc (Four-year programme) successfully, students join the second year of the normal BSc programme to complete their degrees. The possibility of switching over to other faculties such as Engineering, Built Environment and Information Technology, Veterinary Science and Health Sciences, after one or two years in the four-year programme, exists. This depends on selection rules and other conditions stipulated by the other faculties.
d. Students who wish to follow one of the BSc four-year programmes will be subjected to an Institutional Proficiency Test and will be considered for admission by the Admissions Committee. Information in this regard is available at the Client Services Centre.
e. Applications for admission to the BSc (Four-year programme) should be submitted before 30 September each year. Details are obtainable from the Student Administration at the Faculty of Natural and Agricultural Sciences.
f. The rules and regulations applicable to the normal study programmes apply mutatis mutandis to the BSc (Four-year programme), with exceptions as indicated in the regulations pertaining to the BSc (Four-year programme). For instance, students placed in the BSc (Four-year programme) must have a National Senior Certificate with admission for degree purposes.
g. An admissions committee considers applications for the BSc (Four-year programme) annually. Regarding subject choices, admitted students are individually placed on the BSc (Four-year programme) according to their prospective field of study. Students may NOT change this placement without the permission of the Chairperson of the admissions committee.

Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the alphabetical list of modules.

Promotion to next study year

Academic promotion requirements
It is expected of students who register for the first year of the BSc (Four-year programme) to pass all the prescribed modules of the first year.
It is expected of students accepted into the BSc (Four-year programme) to finish a complete corresponding BSc first year within the two years of enrolment in the BSc (Four-year programme). Students who do not show progress during the first semester of the first year will be referred to the Admissions Committee of the Faculty.

Curriculum: Year 1

Minimum credits: 88

Minimum credits:

Fundamental = 24

Core = 48

Elective = 16

Additional information:

Students register for either one of the following elective combinations

- First semester MLB 133 and second semester MLB 143
- First semester WST 133 and second semester WST 143

NB Students may register for an extended module only once.

Fundamental modules

Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language, life and study skills 133 (LST 133) - Credits: 8.00
Language, life and study skills 143 (LST 143) - Credits: 8.00
Academic orientation 120 (UPO 120) - Credits: 0.00

Core modules

Chemistry 133 (CMY 133) - Credits: 8.00
Chemistry 143 (CMY 143) - Credits: 8.00
Physics 133 (PHY 133) - Credits: 8.00
Physics 143 (PHY 143) - Credits: 8.00
Precalculus 133 (WTW 133) - Credits: 8.00
Calculus 143 (WTW 143) - Credits: 8.00

Elective modules

Molecular and cell biology 133 (MLB 133) - Credits: 8.00
Molecular and cell biology 143 (MLB 143) - Credits: 8.00
Mathematical statistics 133 (WST 133) - Credits: 8.00
Mathematical statistics 143 (WST 143) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 24

Minimum credits:

Core = 24

Elective = According to BSc programme of choice

Additional information:

Students must register for the applicable third-semester modules(second year, first semester) and the second-semester, modules must be selected from the normal BSc programme of the student’s choice.

Equivalent modules:

Chemistry extended modules: CMY 133, CMY 143 and CMY 154: Equivalent to BSc module CMY 117

Molecular and cell biology extended modules: MLB 133, MLB 143 and MLB 153: Equivalent to BSc module MLB 111

Physics extended modules: PHY 133, PHY 143 and PHY 153: Equivalent to BSc module PHY 114

Mathematics extended modules: WTW 133, WTW 143 and WTW 153: Equivalent to BSc module WTW 114

Mathematical Statistics extended modules: WST 133, WST 143 and WST 153: Equivalent to BSc module WST 111

Core modules
Chemistry 154 (CMY 154) - Credits: 8.00
Physics 153 (PHY 153) - Credits: 8.00
Calculus 153 (WTW 153) - Credits: 8.00

Elective modules
Biometry 120 (BME 120) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to environmental sciences 101 (ENV 101) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
Cartography 110 (GMC 110) - Credits: 10.00
Informatics 112 (INF 112) - Credits: 10.00
Informatics 154 (INF 154) - Credits: 10.00
Informatics 164 (INF 164) - Credits: 10.00
Informatics 171 (INF 171) - Credits: 20.00
Molecular and cell biology 153 (MLB 153) - Credits: 8.00
First course in physics 124 (PHY 124) - Credits: 16.00
Exploring the universe 154 (SCI 154) - Credits: 16.00
Mechanics 122 (SWK 122) - Credits: 16.00
Climate and weather of Southern Africa 164 (WKD 164) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00
Mathematics 164 (WTW 164) - Credits: 16.00

BSc Food Science (02133406)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the

Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Food Science), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters).

ZEN 161 may be replaced with FNH 121
(This should be read in conjunction with the curriculum for the first year of study)

(GTS 251 and GTS 261) may be replaced with (LEK 210 and LEK 220)
(This should be read in conjunction with the curriculum for the second year of study)

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits:

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

ZEN 161 may be replaced with FNH 121

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to food, nutrition and health 121 (FNH 121) - Credits: 8.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 149

Minimum credits: 149

Core = 149

Additional information:

GTS 251 and GTS 261 may be replaced with LEK 210 and LEK 220

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00

Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introduction to food science and technology 250 (FST 250) - Credits: 12.00
Principles of food processing and preservation 260 (FST 260) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Agricultural economics 220 (LEK 220) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Nutrition 311 (VDG 311) - Credits: 17.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 144

Core modules

Integrated food science 350 (FST 350) - Credits: 18.00
Food chemistry 351 (FST 351) - Credits: 18.00
Food chemistry (2) 352 (FST 352) - Credits: 18.00
Food engineering 353 (FST 353) - Credits: 18.00
Principles of the science and technology of plant food 360 (FST 360) - Credits: 18.00
Animal food science 361 (FST 361) - Credits: 18.00
Advanced animal and plant foods microbiology 362 (FST 362) - Credits: 18.00
Food composition and applied nutritional programmes 364 (VVW 364) - Credits: 18.00

BSc Genetics (02133402)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements
Achievement level

English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Genetics), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for

more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intend applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they obtained an APS of at least 34 and passed grade 12 Mathematics with at least 70%; and
- they may defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the second semester of the first year.
- Students intending to apply for the **BVSc** selection have to enrol for MTL 180(12)

Please note: ANA modules can only be taken by BSc (Medical Science) students.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144
Core = 132
Elective = 12

Additional information:
Single major track:

- Elective may be chosen from BCM 262, PLG 262, MBY 262.

Dual major track:

- Genetics and Biochemistry combination: Students must take BCM 262 and may replace [BOT 251, BOT 261, ZEN 251, ZEN 261] with [CMY 282, CMY 284, CMY 283, CMY 285].
- Genetics and Microbiology combination: Students must take MBY 262.
- Genetics and Plant Science / Zoology / Entomology combination: Elective may be chosen from BCM 262, PLG 262, MBY 262.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Elective modules

Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144
Core = 90
Elective = 54

Additional information:
Single major track:

- Electives may be chosen from any combination of: BCM 356, BCM 357, BCM 367, BCM 368, BOT 356, BOT 358, BOT 365, MBY 351, MBY 355, MBY 364, MBY 365, PLG 351, PLG 363, ZEN 361, ZEN 363.
- Students can only take a module if they comply with all the prerequisites.

Dual major track:

- Genetics and Biochemistry combination: Students must replace BTC 361 with Biochemistry modules and must take [BCM 356, BCM 357, BCM 367, BCM 368] to a total value of 72 credits.
- Genetics and Microbiology combination: Students must replace either GTS 368 or BTC 361 with Microbiology modules, and must take [MBY 351, MBY 355, MBY 364, MBY 365] to a total value of 72 credits.
- Genetics and Plant Science combination: Students must take [BOT 356, BOT 358, BOT 365] to a value of 54 credits. Students may also choose to replace GTS 368 with BOT 366.
- Genetics and Zoology combination: Students must replace either BTC 361 or GTS 368 with Zoology modules, and must take [ZEN 352, ZEN 354, ZEN 361, ZEN 363] to a total value of 72 credits.
- Genetics and Entomology combination: Students must replace either BTC 361 or GTS 368 with Zoology modules, and must take [ZEN 354, ZEN 355, ZEN 361, ZEN 365] to a total value of 72 credits.

Core modules

Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00

Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00

Elective modules
Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00
General plant pathology 351 (PLG 351) - Credits: 18.00
Plant disease control 363 (PLG 363) - Credits: 18.00
Mammalogy 352 (ZEN 352) - Credits: 18.00
Evolutionary physiology 354 (ZEN 354) - Credits: 18.00
Insect diversity 355 (ZEN 355) - Credits: 18.00
Physiological processes 361 (ZEN 361) - Credits: 18.00
Behavioural ecology 363 (ZEN 363) - Credits: 18.00
Applied entomology 365 (ZEN 365) - Credits: 18.00

BSc Geography (02133394)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Geography), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental	=	12
Core	=	74
Elective	=	54

Additional information:

- Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
- Students can take WTW 114 instead of WTW 134 if they meet the entry requirements.
- BSc (Geography) and BSc (Environmental Sciences) students may register for WKD 155. Students are not allowed to earn credits for both WKD 155 and WKD 164.
- Electives can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Plant Production and Soil Science, Chemistry, Plant Science, Physics, Zoology and Entomology, Geology, Mathematics and Applied Mathematics, Computer Science, Anthropology and Archaeology, Economics, History, Psychology, Sociology, Political Sciences.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Introduction to environmental sciences 101 (ENV 101) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Cartography 110 (GMC 110) - Credits: 10.00
Climate and weather of Southern Africa 164 (WKD 164) - Credits: 8.00
Mathematics 134 (WTW 134) - Credits: 16.00

Elective modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
Informatics 154 (INF 154) - Credits: 10.00
Informatics 164 (INF 164) - Credits: 10.00
Informatics 171 (INF 171) - Credits: 20.00
First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00
Exploring the universe 154 (SCI 154) - Credits: 16.00
Atmospheric structure and processes 155 (WKD 155) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core	=	64
Elective	=	80

Elective Modules

CMY 282, CMY 283, CMY 284, CMY 285, GIS 221, GKD 250, GMA 220, INF 214, INF 225, INF 261, SUR 220, WKD 261 & WKD 263

Core modules

Process geomorphology 252 (GGY 252) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Introductory geographic information systems 283 (GGY 283) - Credits: 14.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Informatics 214 (INF 214) - Credits: 14.00
Informatics 225 (INF 225) - Credits: 14.00
Informatics 261 (INF 261) - Credits: 7.00
Surveying 220 (SUR 220) - Credits: 14.00
Physical meteorology 261 (WKD 261) - Credits: 12.00
Introduction to dynamic meteorology 263 (WKD 263) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core	=	116
Elective	=	28

Elective Modules

- GKD 320, GKD 350, GMA 320, GMC 310 & GMT 320

Core modules

Human environmental interactions 301 (ENV 301) - Credits: 18.00
Sustainable development 356 (GGY 356) - Credits: 18.00
Environmental geomorphology 361 (GGY 361) - Credits: 18.00
Development frameworks 366 (GGY 366) - Credits: 18.00
Geographic information systems 310 (GIS 310) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00

Elective modules

Soil chemistry 320 (GKD 320) - Credits: 14.00
Soil classification and surveying 350 (GKD 350) - Credits: 14.00
Remote sensing 320 (GMA 320) - Credits: 22.00
Geometrical and space geodesy 310 (GMC 310) - Credits: 22.00
Geoinformatics project 320 (GMT 320) - Credits: 22.00

BSc Geoinformatics (02133393)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Geoinformatics), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or

otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 156

Minimum credits: 156

Fundamental = 12
Core = 144

Additional information:

- Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
- Students who intend to take mathematics to the 200 level, have to take the combination of WTW 114 and WTW 124 instead of WTW 134, WTW 146 and WTW 148, if they meet the entry requirements.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Introduction to environmental sciences 101 (ENV 101) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Cartography 110 (GMC 110) - Credits: 10.00
Informatics 112 (INF 112) - Credits: 10.00
Informatics 154 (INF 154) - Credits: 10.00
Informatics 164 (INF 164) - Credits: 10.00
Informatics 171 (INF 171) - Credits: 20.00
Business management 114 (OBS 114) - Credits: 10.00
Business management 124 (OBS 124) - Credits: 10.00
Climate and weather of Southern Africa 164 (WKD 164) - Credits: 8.00
Mathematics 134 (WTW 134) - Credits: 16.00
Linear algebra 146 (WTW 146) - Credits: 8.00
Calculus 148 (WTW 148) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 143

Minimum credits: 143

Core = 143

Core modules

Business law 210 (BER 210) - Credits: 16.00
Introduction to moral and political philosophy 251 (FIL 251) - Credits: 10.00
Introductory geographic information systems 283 (GGY 283) - Credits: 14.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Informatics 214 (INF 214) - Credits: 14.00

Informatics 225 (INF 225) - Credits: 14.00
Informatics 261 (INF 261) - Credits: 7.00
Statistics 110 (STK 110) - Credits: 13.00
Statistics 120 (STK 120) - Credits: 13.00
Surveying 220 (SUR 220) - Credits: 14.00

Curriculum: Final year

Minimum credits: 132

Minimum credits: 132

Core = 132

Core modules

Geographic information systems 310 (GIS 310) - Credits: 22.00
Geoinformatics 311 (GIS 311) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00
Remote sensing 320 (GMA 320) - Credits: 22.00
Geometrical and space geodesy 310 (GMC 310) - Credits: 22.00
Geoinformatics project 320 (GMT 320) - Credits: 22.00

BSc Geology (02133023)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Geology), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes

place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences

Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 128
Elective = 16

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Electives:

- Student wishing to take second-year Physics, Mathematics or Applied Mathematics modules to complement the Mechanics modules, must take WTW 114 and WTW 124 instead of WTW 158 and WTW 164.
- Students must select to do one of the following in semester 2:
- PHY124 First Course in Physics, SWK122 Mechanics, or both GMC110 Cartography and GGY166 Southern African Geomorphology
- Students who select PHY 124 are able to continue with a second major in Chemistry, Mathematics, Soil Science or Physics.
- Students who select SWK 122 may continue with a second major in Engineering Geology, Mathematics, Chemistry, Soil Science or Mechanics.
- Students who select GMC110 and GGY166 can carry on with a second major in Applied Earth Science,

Mathematics, Chemistry, or Soil Science.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
First course in physics 114 (PHY 114) - Credits: 16.00
Calculus 158 (WTW 158) - Credits: 16.00
Mathematics 164 (WTW 164) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 150

Minimum credits: 150

Core	=	54
Elective	=	96

Additional information:
Students must select 2 groups of modules (normally 2x48 credits = 96 credits) from the following list, depending on the second major intended:

- **Chemistry:** CMY 282, CMY 283, CMY 284, CMY 285 (48 credits)
- **Mathematics:** WTW 211, WTW 218, WTW 220, WTW 221 (48 credits)
- **Applied Mathematics:** WTW 211, WTW 218, WTW 248, WTW 286 (48 credits)
- **Physics:** PHY 263, PHY 255 (48 credits) and WTW 211, WTW 218, WTW 220, WTW 248 (48 credits)
- **Engineering Geology/Soil Science/Mechanics:** GKD 250, SWK 210, GIS 221 (40 credits)
- **GIS/Geomorphology:** GKD 250, GGY 283, GMA 220 (40 credits)

Core modules

Sedimentology 253 (GLY 253) - Credits: 12.00
Fundamental and applied mineralogy 255 (GLY 255) - Credits: 12.00
Igneous petrology 261 (GLY 261) - Credits: 12.00
Metamorphic petrology 262 (GLY 262) - Credits: 12.00
Geological field mapping 266 (GLY 266) - Credits: 6.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Introductory geographic information systems 283 (GGY 283) - Credits: 14.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00

Introductory soil science 250 (GKD 250) - Credits: 12.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Waves, thermodynamics and modern physics 255 (PHY 255) - Credits: 24.00
General physics 263 (PHY 263) - Credits: 24.00
Strength of materials 210 (SWK 210) - Credits: 16.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 78
Elective = 66

Additional information:
Elective Modules (Credits = 66)

Students must select one group of modules (at least 66 credits each) from the following list, provided the appropriate second year modules were taken:

- **Chemistry:** CMY382, CMY 383, CMY384, CMY385 (72 credits)
- **Mathematics:** WTW 310, WTW 320, WTW 381, WTW 389 (72 credits)
- **Applied Mathematics:** WTW 382, WTW 383, WTW 386, WTW 387 (72 credits)
- **Physics:** PHY 364, PHY 356 (72 credits)
- **Astrophysics:** PHY 300, GMS 320, GIS 320 (82 credits) – Notes: PHY 300 requires PHY 255 and 263 as prerequisites; this option does not allow entry into Physics Honours
- **Engineering Geology/Soil Science/Mechanics:** GKD 350, SGM 311, GLY 363, GLY 364 (66 credits)
- **Applied Earth Science:** GMA 320, GIS 310, GKD 320, GKD 350 (72 credits)

Core modules

Structural geology 365 (GLY 365) - Credits: 18.00
Groundwater 366 (GLY 366) - Credits: 18.00
Economic geology 367 (GLY 367) - Credits: 36.00
Advanced Geological field mapping 368 (GLY 368) - Credits: 6.00

Elective modules

Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Geographic information systems 310 (GIS 310) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00
Soil chemistry 320 (GKD 320) - Credits: 14.00
Soil classification and surveying 350 (GKD 350) - Credits: 14.00
Engineering geology 363 (GLY 363) - Credits: 18.00

Rock mechanics 364 (GLY 364) - Credits: 18.00
Remote sensing 320 (GMA 320) - Credits: 22.00
Soil-water relationship and irrigation 350 (PGW 350) - Credits: 14.00
Observational astronomy 300 (PHY 300) - Credits: 36.00
Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00
Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00
Soil mechanics 311 (SGM 311) - Credits: 16.00
Analysis 310 (WTW 310) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Algebra 381 (WTW 381) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00
Geometry 389 (WTW 389) - Credits: 18.00

BSc Human Genetics (02133409)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Human Genetics), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements

Achievement level English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides

otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits:140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intend applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the **second** semester of the first year.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 144

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 72

Elective = 72

Additional information:

Single major track:

- Electives must be chosen from BCM 356, BCM 357, BCM 367, BCM 368, BOT 365, BTC 361, FAR 381, FAR 382, MBY 351, MBY 355, MBY 364, MBY 365.

Dual major track:

- **Genetics and Human Physiology combination:** Students must take FLG 327, FLG 330, FLG 331, FLG 332.

Core modules

Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00

Elective modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Pharmacology 381 (FAR 381) - Credits: 18.00
Pharmacology 382 (FAR 382) - Credits: 18.00
Higher neurological functions 327 (FLG 327) - Credits: 18.00
Cellular and developmental physiology 330 (FLG 330) - Credits: 18.00
Exercise and nutrition science 331 (FLG 331) - Credits: 18.00
Applied and pathophysiology 332 (FLG 332) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00

BSc Human Physiology (02133408)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	

5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Human Physiology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements

Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the

list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits:

Fundamental = 12
Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intending to apply for the MBChB, or the BChD places that become available in the second semester, may only enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they obtained an APS of at least 34 and passed grade 12 Mathematics with at least 70%; and
- they may defer doing WTW 134 in the first semester, however, should they not be selected and want to

continue with a BSc programme, WTW 165 must be taken in the second semester of the first year.

Please note: ANA modules can only be taken by BSc (Medical Science) students.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 120
Elective = 24

Additional information:

Single major track:
Electives must be chosen from BOT 251, BOT 261, CMY 282, CMY 283, CMY 284, CMY 285, MBY 251, MBY 261, ZEN 251, ZEN 261.

Dual major track:

- **Human Physiology and Biochemistry combination:** Students must take MBY 251 and 261.
- **Human Physiology and Chemistry combination:** Please discuss options with Head of the Department of Physiology.
- **Human Physiology and Genetics combination:** Students must take MBY 251 and 261.
- **Human Physiology and Microbiology combination:** Students must replace BCM 262 with MBY 262. Students must take MBY 251 and MBY 261.
- **Human Physiology and Pharmacology combination:** No 200-level prerequisites for 300-level Pharmacology modules, students must register for other 200-level elective modules (24 credits).
- **Human Physiology and Plant Science combination:** Please discuss options with Head of the Department of Plant and Soil Sciences.
- **Human Physiology and Zoology combination:** Please discuss options with Head of the Department of Zoology.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00

Elective modules

South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core	=	72
Elective	=	72

Additional information:

Single major track:

- Electives in the third year must be chosen from the listed Biochemistry, Chemistry, Genetics, Microbiology, Plant science, Zoology or a combination of Pharmacology and Biochemistry and/or Genetics modules.
- NOTE: Students interested in pursuing postgraduate studies in occupational health and safety must take FLG 322 Industrial Physiology (18 credits). The balance of their elective credits may be chosen from 300-level modules in Biochemistry or Genetics or a combination of Pharmacology (FAR 381 and 382) and Biochemistry and/or Genetics.
- Any other student interested in the field of occupational health and safety may take FLG 322 as an elective.

Dual major track:

- **Human Physiology and Biochemistry combination:** Students must take BCM 356, BCM 357, BCM 367, BCM 368.
- **Human Physiology and Chemistry combination:** Please discuss options with Head of the Department of Physiology.
- **Human Physiology and Genetics combination:** Students must take GTS 351, GTS 354, GTS 367, GTS 368.

- **Human Physiology and Microbiology combination:** Students must take MBY 351, MBY 355, MBY 364, MBY 365.
- **Human Physiology and Pharmacology combination:** Students must take FAR 381 and 382 combined with 300-level modules in Biochemistry and/or Genetics to a total of 72 credits.
- **Human Physiology and Plant Science combination:** Please discuss options with Head of the Department of Plant and Soil Sciences.
- **Human Physiology and Zoology combination:** Please discuss options with Head of the Department of Zoology.
- NOTE: Students interested in pursuing postgraduate studies in occupational health and safety must also take FLG 322 Industrial Physiology (18 credits). In order to obtain the degree with a dual major in any of the above, the stipulated electives must be taken. Any student interested in the field of occupational health and safety may also take FLG 322 as an elective.

Core modules

Higher neurological functions 327 (FLG 327) - Credits: 18.00
Cellular and developmental physiology 330 (FLG 330) - Credits: 18.00
Exercise and nutrition science 331 (FLG 331) - Credits: 18.00
Applied and pathophysiology 332 (FLG 332) - Credits: 18.00

Elective modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Pharmacology 381 (FAR 381) - Credits: 18.00
Pharmacology 382 (FAR 382) - Credits: 18.00
Industrial physiology 322 (FLG 322) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00

BSc Human Physiology, Genetics and Psychology (02133396)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is

deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.

- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Human Physiology, Genetics and Psychology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intend applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the **second** semester of the first year.
- Students intending to apply for the **BVSc** selection have to enrol for MTL 180(12)

Please note: ANA modules can **only** be taken by BSc (Medical Science) students.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Psychology 110 (SLK 110) - Credits: 12.00
Psychology 120 (SLK 120) - Credits: 12.00
Mathematics 134 (WTW 134) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 148

Minimum credits: 148

Core = 148

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Psychology 210 (SLK 210) - Credits: 20.00
Psychology 220 (SLK 220) - Credits: 20.00

Curriculum: Final year

Minimum credits: 138

Minimum credits: 138

Core = 138

Additional information:

Students who intend applying for the BSocSciHons (Psychology) programme must complete SLK 320.
Students intend to applying for BScHons (Genetics) must complete the module GTS 367 in their third year.

Please note that these modules are no longer listed as electives, as they have to be enrolled for non-degree purposes

Core modules

Higher neurological functions 327 (FLG 327) - Credits: 18.00
Exercise and nutrition science 331 (FLG 331) - Credits: 18.00
Applied and pathophysiology 332 (FLG 332) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
Psychology 310 (SLK 310) - Credits: 30.00

BSc Mathematical Statistics (02133274)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements

Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	6	B	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Mathematical Statistics), may be considered for admission to the BSc – Extended programme for the Mathematical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc – Extended programme for the Mathematical Sciences Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 64
Elective = 64

Electives should be chosen as follows:

- Students in Mathematical Statistics who also want to be trained for the Mathematics industry should choose from WTW 123 (8), 115 (8), 152 (8), 162 (8), COS 132 (16) and COS 122 (16) or 151 (8).
- Students in Mathematical Statistics who also want to be trained for the Insurance industry and/or Econometrics,

should choose: WTW 152 (8), WTW 123 (8), IAS 111 (6), 121 (6), EKN 110 (10), 120 (10), and either FBS 110 (10), 120 (10) or FBS 112 (10), 122 (10).
- Students in Mathematical Statistics with other career requirements, choose modules from any other subject/faculty to meet their specific needs.

Fundamental modules
Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules
Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Mathematics 124 (WTW 124) - Credits: 16.00

Elective modules
Operating systems 122 (COS 122) - Credits: 16.00
Imperative programming 132 (COS 132) - Credits: 16.00
Introduction to computer science 151 (COS 151) - Credits: 8.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial management 110 (FBS 110) - Credits: 10.00
Financial management 112 (FBS 112) - Credits: 10.00
Financial management 120 (FBS 120) - Credits: 10.00
Financial management 122 (FBS 122) - Credits: 10.00
Actuarial and Financial Mathematics in practice 111 (IAS 111) - Credits: 6.00
Actuarial and Financial Mathematics in practice 121 (IAS 121) - Credits: 6.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

Curriculum: Year 2
Minimum credits: 140

Minimum credits: 140

Core = 96
Elective = 44

Elective Modules (Credits = 44)

- Students in Mathematical Statistics who also want to be trained for the Mathematics industry should choose WTW 264 (12), WTW 286 (12), 285 (12) and 248 (12).
- Students in Mathematical Statistics who also want to be trained for the Insurance Industry should choose IAS 211 (6) IAS 221 (6), IAS 282 (12) and WST 212 (12).
- Students in Mathematical Statistics who also want to be trained for the Econometrics industry should choose:

EKN 214(16), 224 (16) and WST 212 (12).
- Students in Mathematical Statistics with other career requirements, may choose modules from any other subject/faculty to meet their specific needs but should consult with the Department of Statistics in this regard.

Core modules
Mathematical statistics 211 (WST 211) - Credits: 24.00
Mathematical statistics 221 (WST 221) - Credits: 24.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00

Elective modules
Economics 214 (EKN 214) - Credits: 16.00
Economics 224 (EKN 224) - Credits: 16.00
Financial mathematics 211 (IAS 211) - Credits: 12.00
Contingencies 221 (IAS 221) - Credits: 12.00
Financial mathematics 282 (IAS 282) - Credits: 12.00
Applications in data science 212 (WST 212) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Differential equations 264 (WTW 264) - Credits: 12.00
Discrete structures 285 (WTW 285) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year
Minimum credits: 140

Minimum credits: 140

Core = 86
Elective = 54

Additional Information:

- Students in Mathematical Statistics who also want to be trained for the Mathematics industry should choose two of the following: WTW 310 (18), 320 (18), 354 (18), 364 (18), 381 (18), 382 (18), 383 (18), 386 (18), 387 (18), 389 (18).
- Students in Mathematical Statistics who also want to be trained for the Insurance industry should choose WTW 354 (18), WTW 364 (18) and WST 322 (18).
- Students in Mathematical Statistics who also want to be trained for the Econometrics industry should choose three of the following: EKN 310 (20), 320 (20), 314 (20), 325 (20) or WST 322 (18).
- Students in Mathematical Statistics with other career requirements, may choose modules from any other subject/faculty to meet their specific needs but should consult with the Department of Statistics in this regard.

Core modules
Statistics 320 (STK 320) - Credits: 25.00
The science of data analytics 353 (STK 353) - Credits: 25.00
Multivariate analysis 311 (WST 311) - Credits: 18.00
Stochastic processes 312 (WST 312) - Credits: 18.00

Elective modules

Economics 310 (EKN 310) - Credits: 20.00
Economics 314 (EKN 314) - Credits: 20.00
Economics 320 (EKN 320) - Credits: 20.00
Economics 325 (EKN 325) - Credits: 20.00
Survival models 382 (IAS 382) - Credits: 18.00
Actuarial statistics 322 (WST 322) - Credits: 18.00
Analysis 310 (WTW 310) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Financial engineering 354 (WTW 354) - Credits: 18.00
Financial engineering 364 (WTW 364) - Credits: 18.00
Algebra 381 (WTW 381) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00
Geometry 389 (WTW 389) - Credits: 18.00

BSc Mathematics (02133263)

Minimum duration of study	3 years
Contact	Prof R Anguelov roumen.anguelov@up.ac.za +27 (0)124202520

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	6	B	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Mathematics), may be considered for admission to the BSc – Extended programme for the Mathematical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc – Extended programme for the Mathematical Sciences

Minimum requirements				
Achievement level				
English Home Language or English First Additional Language		**Mathematics**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	5	C	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the

relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 138

Minimum credits: 138

Fundamental = 12

Core = 96

Elective = 30

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Choose electives according to the following combinations with a view to pursuing specialisation in the relevant field:

Physics:	PHY 114 & PHY 124	(32 credits)
Chemistry:	CMY 117 & CMY 127	(32 credits)
Economics:	EKN 110, EKN 120 and one of FRK 111 or OBS 114 or FBS 112	(30 credits)

Students who want to take other electives must consult the Undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00

Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

Elective modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Financial management 112 (FBS 112) - Credits: 10.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Business management 114 (OBS 114) - Credits: 10.00
First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 132

Minimum credits: 132

Core = 84

Elective = 48

Additional information:

Choose electives according to the following combinations with a view to pursuing specialisation in the relevant field:

Physics:	PHY 255 & PHY 263	(48 credits)
Chemistry:	CMY 282, CMY 283, CMY 284 & CMY 285	(48 credits)
Economics:	EKN 214, EKN 224 & EKN 234	(48 credits)
Statistics:	WST 211 & WST 221	(48 credits)

Students who want to take other electives must consult the Undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Core modules

Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00
Discrete structures 285 (WTW 285) - Credits: 12.00

Differential equations 286 (WTW 286) - Credits: 12.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Economics 214 (EKN 214) - Credits: 16.00
Economics 224 (EKN 224) - Credits: 16.00
Economics 234 (EKN 234) - Credits: 16.00
Waves, thermodynamics and modern physics 255 (PHY 255) - Credits: 24.00
General physics 263 (PHY 263) - Credits: 24.00
Mathematical statistics 211 (WST 211) - Credits: 24.00
Mathematical statistics 221 (WST 221) - Credits: 24.00
Differential equations 256 (WTW 256) - Credits: 8.00
Calculus 258 (WTW 258) - Credits: 8.00
Numerical methods 263 (WTW 263) - Credits: 8.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 72

Elective = 72

Additional information:

Students may choose modules from Physics, Chemistry, Economics, Mathematical Statistics, Applied Mathematics and Financial Mathematics.

1. Students who wish to pursue an honours degree in Physics should take PHY 356 & PHY 364.

2. Students who wish to pursue an honours degree in Chemistry should take CMY 382, CMY 383, CMY 384 & CMY 385.

3. Students who wish to pursue an honours degree in Economics should take EKN 310, EKN 320, EKN 325 & WTW 383.

4. Students who wish to pursue an honours degree in Mathematical Statistics should take WST 311, WST 312, WST 321, WST 322 & STK 353.5. Students who wish to pursue an honours degree in Applied Mathematics should take WTW 382, WTW 386, WTW 383 & WTW 387.

6. Students who wish to pursue an honours degree in Financial Mathematics should take WTW 354 & WTW 364, and two modules from WST 311, WST 312, WST 321 & WST 322.

Students who want to take other electives must consult the Undergraduate Programme Coordinator in the Department of Mathematics and Applied Mathematics.

Core modules

Analysis 310 (WTW 310) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Algebra 381 (WTW 381) - Credits: 18.00
Geometry 389 (WTW 389) - Credits: 18.00

Elective modules

Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Economics 310 (EKN 310) - Credits: 20.00
Economics 320 (EKN 320) - Credits: 20.00
Economics 325 (EKN 325) - Credits: 20.00
Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00
Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00
The science of data analytics 353 (STK 353) - Credits: 25.00
Multivariate analysis 311 (WST 311) - Credits: 18.00
Stochastic processes 312 (WST 312) - Credits: 18.00
Time-series analysis 321 (WST 321) - Credits: 18.00
Actuarial statistics 322 (WST 322) - Credits: 18.00
Financial engineering 354 (WTW 354) - Credits: 18.00
Financial engineering 364 (WTW 364) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00

BSc Medical Sciences (02133407)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will

be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Medical Sciences), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student’s responsibility to acertain, prior to registration, whether they comply with the

prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 142

Minimum credits: 142

Fundamental = 12
Core = 130

Additional information:

- Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.
- Students intend applying for MBChB, or BChD selection, have to enrol for MGW 112(6) and MTL 180(12) with the understanding that they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the second semester of the first year.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00

Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Introduction: Human anatomy and embryology 121 (ANA 121) - Credits: 4.00
Human osteology 122 (ANA 122) - Credits: 4.00
Basic human histology 126 (ANA 126) - Credits: 4.00
Biometry 120 (BME 120) - Credits: 16.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Science and world views 155 (FIL 155) - Credits: 6.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Core = 96
Elective = 48

Additional information:

- **FLG option:** 48 credits, GTS option: 48 credits, FAR option: same as FLG option
- **ANA + FLG option:** First semester FLG 211 (12) and FLG 212 (12) second semester FLG 221 (12) and FLG 222 (12)
- **ANA + GTS option:** First semester GTS 251 (12) and MBY 251 (12), second semester GTS 261 (12) and MBY 261 (12)
- **ANA + FLG/FAR option only in Final year:** Same as FLG option

Core modules

Human cell and developmental biology 214 (ANA 214) - Credits: 12.00
Paleoanthropology 215 (ANA 215) - Credits: 12.00
Human histology 226 (ANA 226) - Credits: 12.00
Human anatomy Part 1 247 (ANA 247) - Credits: 12.00
Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00

Elective modules

Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00

Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 72
Elective = 72

Additional information:
Elective credits:

- **FLG option:** 72 credits, GTS option: 72 credits, FLG/FAR option: 72 credits
- **ANA + FLG option:** First semester FLG 330 (18) and FLG 327 (18), second semester FLG 331 (18) and FLG 332 (18)
- **ANA+ GTS option:** First semester GTS 351 (18) and GTS 354 (18), second semester GTS 367 (18) and GTS 368 (18).
- **ANA+ FLG/FAR option:** First semester FLG 330 (18) and FAR 381 (18), second semester FLG 331 (18) or FLG 332 (18) and FAR 382 (18)

Core modules

Forensic anthropology 315 (ANA 315) - Credits: 18.00
Cell and tissue techniques 316 (ANA 316) - Credits: 18.00
Human cell and developmental biology 324 (ANA 324) - Credits: 18.00
Human anatomy Part 2 347 (ANA 347) - Credits: 18.00

Elective modules

Pharmacology 381 (FAR 381) - Credits: 18.00
Pharmacology 382 (FAR 382) - Credits: 18.00
Higher neurological functions 327 (FLG 327) - Credits: 18.00
Cellular and developmental physiology 330 (FLG 330) - Credits: 18.00
Exercise and nutrition science 331 (FLG 331) - Credits: 18.00
Applied and pathophysiology 332 (FLG 332) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00

BSc Meteorology (02133313)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a

candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Meteorology), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study

programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are

passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 142

Minimum credits: 142

Fundamental = 12

Core = 114

Electives = 16

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Electives for the first to third year can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Geology, Plant Production and Soil Science, Chemistry, Plant Science, Mathematics and Applied Mathematics, Physics, Computer Science.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Cartography 110 (GMC 110) - Credits: 10.00
First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00
Atmospheric structure and processes 155 (WKD 155) - Credits: 16.00
Calculus 114 (WTW 114) - Credits: 16.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematics 124 (WTW 124) - Credits: 16.00

Elective modules

General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to environmental sciences 101 (ENV 101) - Credits: 8.00
Aspects of human geography 156 (GGY 156) - Credits: 8.00
Southern African geomorphology 166 (GGY 166) - Credits: 8.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
Cartography 110 (GMC 110) - Credits: 10.00
Exploring the universe 154 (SCI 154) - Credits: 16.00
Mechanics 122 (SWK 122) - Credits: 16.00
Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00

Discrete structures 115 (WTW 115) - Credits: 8.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 136

Minimum credits: 136

Core = 88

Elective = 48

Additional information:

Elective Modules (Credits = 48)

Students must select elective modules to the value of at least 48 credits. Depending on a student's interests, the following combinations of modules are recommended:

- Meteorology students who also want to be trained in Geography or Geoinformatics usually choose from GGY 252* (12), GGY 266 (24), GGY 283* (14) and SUR 220* (14)
- Meteorology students who are interested in Mathematics and Applied Mathematics normally choose from WTW 211* (12), WTW 221* (12), WTW 285*(12), WTW 286* (12) OR WTW 264* (12)
- Meteorology students who are interested in Mathematical Statistics choose from WST 211* (24) and WST 221* (24)
- Meteorology students who also want to be trained in Physics should choose from PHY 255* (24) and PHY 263* (24)
- Students in Meteorology may choose modules from any other subject/faculty to meet their specific needs.
- *Prerequisites required

Core modules

Geographic data analysis 220 (GIS 220) - Credits: 14.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Programming in meteorology 254 (WKD 254) - Credits: 12.00
Physical meteorology 261 (WKD 261) - Credits: 12.00
Introduction to dynamic meteorology 263 (WKD 263) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00

Elective modules

Process geomorphology 252 (GGY 252) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Introductory geographic information systems 283 (GGY 283) - Credits: 14.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Waves, thermodynamics and modern physics 255 (PHY 255) - Credits: 24.00
General physics 263 (PHY 263) - Credits: 24.00
Surveying 220 (SUR 220) - Credits: 14.00
Mathematical statistics 211 (WST 211) - Credits: 24.00
Mathematical statistics 221 (WST 221) - Credits: 24.00

Linear algebra 211 (WTW 211) - Credits: 12.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Differential equations 264 (WTW 264) - Credits: 12.00
Discrete structures 285 (WTW 285) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year

Minimum credits: 142

Minimum credits: 144

Core = 90

Elective = 54

Additional information:

Depending on a student's second major and other interests, the following modules are recommended:

- Meteorology students who also want to be trained in Geography usually choose from GGY356 (18), GGY 363* (12), GGY 366 (18)
- Meteorology students who also want to be trained in Geoinformatics usually choose from GMA 320* (22), GMC 310* (22), GIS 310* (22), GIS 311* (22) and GIS 320* (22),
- Meteorology students who are interested in Mathematics and Applied Mathematics normally choose from WTW 382* (18 credits), WTW 383* (18 credits), WTW 386* (18 credits) or WTW 387* (18 credits)
- Meteorology students who are interested in Mathematical Statistics choose WST 311* (18) and WST 321* (18)
- Meteorology students who also want to be trained in Physics should choose from PHY 356* (36), PHY 364* (36)
- Students in Meteorology may choose modules from any other subject/faculty to meet their specific needs.
- *Prerequisites required

Core modules

Human environmental interactions 301 (ENV 301) - Credits: 18.00
Atmospheric vorticity and divergence 352 (WKD 352) - Credits: 18.00
Quasi-geostrophic analysis 361 (WKD 361) - Credits: 18.00
Fundamentals of weather forecasting 366 (WKD 366) - Credits: 36.00

Elective modules

Sustainable development 356 (GGY 356) - Credits: 18.00
Applied geomorphology 363 (GGY 363) - Credits: 12.00
Development frameworks 366 (GGY 366) - Credits: 18.00
Geographic information systems 310 (GIS 310) - Credits: 22.00
Geoinformatics 311 (GIS 311) - Credits: 22.00
Spatial analysis 320 (GIS 320) - Credits: 22.00
Soil chemistry 320 (GKD 320) - Credits: 14.00
Remote sensing 320 (GMA 320) - Credits: 22.00
Geometrical and space geodesy 310 (GMC 310) - Credits: 22.00
Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00

Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00
Principles of veld management 310 (WDE 310) - Credits: 12.00
Multivariate analysis 311 (WST 311) - Credits: 18.00
Time-series analysis 321 (WST 321) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00

BSc Microbiology (02133404)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Microbiology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.

- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140
Fundamental = 12
Core = 128

Additional information: Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intend applying for **MBChB**, or **BChD** selection, have to enrol for FIL 155(6), MGW 112(6) and MTL 180(12) with the understanding that:

- they defer doing WTW 134 in the first semester, however, should they not be selected and want to continue with a BSc programme, WTW 165 must be taken in the **second** semester of the first year.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Mathematics 165 (WTW 165) - Credits: 16.00

Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits:
Core = 144

Additional information:
Single major track:

- **Applied Microbiology option:** ZEN 251 may be replaced with FST 250. Students may replace ZEN 261 and/or BOT 261 with either PLG 262 or FST 260 or BCM 262.
- **Medical Microbiology option:** Students must replace ZEN 251 and BOT 251 with FLG 211 and FLG 212. Students must replace ZEN 261 and BOT 261 with FLG 221 and FLG 222.

Dual major track:

- **Microbiology and Biochemistry combination:** Students must replace ZEN 251 and BOT 251 with CMY 282 and CMY 284. Students must replace ZEN 261 and BOT 261 with CMY 283 and BCM 262.
- **Microbiology and Genetics combination:** Students may replace ZEN 261 with PLG 262.
- **Microbiology and Plant Science option:** Students may replace ZEN 261 with PLG 262.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Introduction to food science and technology 250 (FST 250) - Credits: 12.00
Principles of food processing and preservation 260 (FST 260) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144
Core = 72
Elective = 72

Additional information:
Single major track:

- **Applied Microbiology option:** Students may select electives from BCM 356, BCM 357, BOT 356, BOT 358, GTS 351, GTS 354, PLG 351, ZEN 355, BCM 367, BCM 368, BOT 365, BTC 361, FST 362, GTS 367 or ZEN 365.
- **Medical Microbiology option:** Students may select electives from BCM 356, BCM 357, BCM 367, BCM 368, GTS 351, GTS 354, GTS 367 or GTS 368.
- Students can only take a module if they comply with all the prerequisites.

Dual major track:

- **Microbiology and Biochemistry combination:** Students must take BCM 356, BCM 357, BCM 367 and BCM 368.
- **Microbiology and Genetics combination:** Students must take GTS 351, GTS 354, GTS 367 and either GTS 368 or BTC 361.
- **Microbiology and Plant Science option:** Students must take BOT 356, BOT 358, BOT 365 and BTC 361.

Core modules
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00

Elective modules
Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Advanced animal and plant foods microbiology 362 (FST 362) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
General plant pathology 351 (PLG 351) - Credits: 18.00
Insect diversity 355 (ZEN 355) - Credits: 18.00
Applied entomology 365 (ZEN 365) - Credits: 18.00

BSc Nutrition (02133322)

Minimum duration of study	4 years

Programme information

The BSc (Nutrition) degree programme is offered by the Faculty of Natural and Agricultural Sciences. Students are, however, enrolled for modules in both the Faculty of Natural and Agricultural Sciences and the Faculty of Health Sciences.

It is expected of students following the Public Health Nutrition option to undergo internship training. The module FNH 480 will be administered by the Department of Human Nutrition in the Faculty of Health Sciences

Also consult the General Regulations.

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Nutrition), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year

within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.

- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 132

Minimum credits: 132

Fundamental = 12

Core = 120

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introduction to food, nutrition and health 121 (FNH 121) - Credits: 8.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00

Curriculum: Year 2

Minimum credits: 147

Minimum credits: 147

Core = 147

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00

Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introductory and neurophysiology 211 (FLG 211) - Credits: 12.00
Circulatory physiology 212 (FLG 212) - Credits: 12.00
Lung and renal physiology, acid-base balance and temperature 221 (FLG 221) - Credits: 12.00
Digestion, endocrinology and reproductive systems 222 (FLG 222) - Credits: 12.00
Human nutrition 210 (HNT 210) - Credits: 27.00
Human nutrition 220 (HNT 220) - Credits: 24.00

Curriculum: Year 3

Minimum credits: 120

Minimum credits: 120

Core = 120

Core modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Food and nutrition security 320 (FNH 320) - Credits: 8.00
Food chemistry 351 (FST 351) - Credits: 18.00
Food chemistry (2) 352 (FST 352) - Credits: 18.00
Nutritional assessment 314 (NTA 314) - Credits: 22.00
Food composition and applied nutritional programmes 364 (VVW 364) - Credits: 18.00

Curriculum: Final year

Minimum credits: 142

Minimum credits: 142

Core = 142

Core modules

Biometry 210 (BME 210) - Credits: 24.00
Research project 400 (FNH 400) - Credits: 40.00
Advanced food, nutrition and health 420 (FNH 420) - Credits: 20.00
International nutrition 421 (FNH 421) - Credits: 20.00
Research methodology and seminar 400 (FST 400) - Credits: 20.00
Advanced human nutrition 411 (HNT 411) - Credits: 18.00

BSc Physics (02133203)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a

candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.

- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**32**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Physics), may be considered for admission to the BSc – Extended programme for the Physical Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Physical Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**26**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 64

Electives = 64

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students must select elective modules with a total number of at least 64 credits according to the following streams. (Deviations allowed with permission from the head of department):

- **Mathematics as second major:** Due to the modules prescribed for the BSc (Physics) module, taking mathematics as a second major in 3rd year is possible for all options. Please select one of the options below.
- **Second major in applied mathematics or mathematical statistics:** WTW 115, WTW 152, WTW 162, WTW 123, WST 111, WST 121 (64 credits)
- **Second major in chemistry or applied mathematics:** CMY 117, CMY 127, WTW 162, WTW 123, WTW 115, WTW 152 (64 credits)
- **Second major in chemistry or mathematical statistics:** CMY 117, CMY 127, WST 111, WST 121 (64 credits)
- **Second major in chemistry or geology:** CMY 117, CMY 127, GLY 155, GLY 163 (64 credits)
- **Second major in chemistry or meteorology:** CMY 117, CMY 127, WKD 155, WTW 123, WTW 162 (64 credits).
- **Second major in chemistry with interest in biophysics:** CMY 117, CMY 127, MLB 111, GTS 161, BOT 161 (64 credits)
- **Second major in chemistry with interest in astronomy:** CMY 117, CMY 127, WTW 162, WTW 123, SCI 154 (64 credits)
- **Second major in applied mathematics with an interest in astronomy:** WTW 115, WTW 152, WTW 162, WTW 123, SCI 154, COS 132 (64 credits) note: semesters unbalanced – Year credits: S1:80, S2: 48
- **Computational physics:** WTW 123, COS 132, COS 110, COS 122, COS 151 (64 credits note: semesters unbalanced – Year credits: S1:56, S2: 72)

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

First course in physics 114 (PHY 114) - Credits: 16.00
First course in physics 124 (PHY 124) - Credits: 16.00

Calculus 114 (WTW 114) - Credits: 16.00
Mathematics 124 (WTW 124) - Credits: 16.00

Elective modules
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Program design: Introduction 110 (COS 110) - Credits: 16.00
Operating systems 122 (COS 122) - Credits: 16.00
Imperative programming 132 (COS 132) - Credits: 16.00
Introduction to computer science 151 (COS 151) - Credits: 8.00
Introduction to geology 155 (GLY 155) - Credits: 16.00
Earth history 163 (GLY 163) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Exploring the universe 154 (SCI 154) - Credits: 16.00
Atmospheric structure and processes 155 (WKD 155) - Credits: 16.00
Mathematical statistics 111 (WST 111) - Credits: 16.00
Mathematical statistics 121 (WST 121) - Credits: 16.00
Discrete structures 115 (WTW 115) - Credits: 8.00
Numerical analysis 123 (WTW 123) - Credits: 8.00
Mathematical modelling 152 (WTW 152) - Credits: 8.00
Dynamical processes 162 (WTW 162) - Credits: 8.00

Curriculum: Year 2
Minimum credits: 144

Minimum credits: 144

Core = 96

Elective = 48

Additional information:

Students must select elective modules with a total number of at least 48 credits according to the following streams (deviations allowed with permission from the head of department):

- **Mathematics as second major:** Due to the modules prescribed for the BSc (Physics) module, taking mathematics as a second major in 3rd year is possible for all options.
- **Second major applied mathematics:** WTW 285, WTW 286, WTW 221 (36 credits – an additional 12 credits will have to be taken in 2nd or 3rd year. PHY 353, PHY 363 or additional 3rd year mathematics module recommended).
- **Second major statistics:** WST 211, WST 221 (48 credits)
- **Second major in chemistry:** CMY 282, CMY 283, CMY 284, CMY 285 (48 credits).
- **Second major in geology:** GLY 253, GLY 255, GLY 261, GLY 262 (48 credits).
- **Second major in meteorology:** WKD 261, WKD 263, WKD 254 (**permission from HOD Required**), WTW 286 (48 credits). (Q: **GMA 220 instead of WKD 254**)
- **Interest in astronomy:** PHY 210, WTW 221, WTW 286 (48 credits Unbalanced: Year credits S1: 60, S2: 84)
- **Interest in computational physics:** COS 210, COS 212, COS 226, COS 284 (56 credits) 24 + 32 = 56 credits = excess of 8 credits in second semester.

Core modules

Waves, thermodynamics and modern physics 255 (PHY 255) - Credits: 24.00
General physics 263 (PHY 263) - Credits: 24.00
Linear algebra 211 (WTW 211) - Credits: 12.00
Calculus 218 (WTW 218) - Credits: 12.00
Analysis 220 (WTW 220) - Credits: 12.00
Vector analysis 248 (WTW 248) - Credits: 12.00

Elective modules

Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Theoretical computer science 210 (COS 210) - Credits: 8.00
Data structures and algorithms 212 (COS 212) - Credits: 16.00
Concurrent systems 226 (COS 226) - Credits: 16.00
Computer organisation and architecture 284 (COS 284) - Credits: 16.00
Process geomorphology 252 (GGY 252) - Credits: 12.00
Geomorphology of the built environment 265 (GGY 265) - Credits: 12.00
City structure, environment and society 266 (GGY 266) - Credits: 24.00
Geographic data analysis 220 (GIS 220) - Credits: 14.00
Sedimentology 253 (GLY 253) - Credits: 12.00
Fundamental and applied mineralogy 255 (GLY 255) - Credits: 12.00
Igneous petrology 261 (GLY 261) - Credits: 12.00
Metamorphic petrology 262 (GLY 262) - Credits: 12.00
Remote sensing 220 (GMA 220) - Credits: 14.00
Astronomy for physicists 210 (PHY 210) - Credits: 24.00
Programming in meteorology 254 (WKD 254) - Credits: 12.00
Physical meteorology 261 (WKD 261) - Credits: 12.00
Introduction to dynamic meteorology 263 (WKD 263) - Credits: 12.00
Mathematical statistics 211 (WST 211) - Credits: 24.00
Mathematical statistics 221 (WST 221) - Credits: 24.00
Linear algebra 221 (WTW 221) - Credits: 12.00
Differential equations 256 (WTW 256) - Credits: 8.00
Discrete structures 285 (WTW 285) - Credits: 12.00
Differential equations 286 (WTW 286) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core = 72

Elective = 72

Additional information:

Students must select elective modules with a total number of at least 72 credits from the following streams (deviations allowed with permission from the head of department):

- **Mathematics as second major:** WTW 310, WTW 320, WTW 381 and WTW 389 (72 credits).
- **Applied Mathematics as second major:** WTW 310, WTW 382, WTW 383 and WTW 386 and WTW 387 (90 credits)*.
- **Mathematical statistics as second major:** WST 311, WST 312, WST 321, STK 353 (79 credits) Unbalanced: 36 + 43
- **Chemistry as second major:** CMY 382, CMY 383, CMY 384, CMY 385 (72 credits).
- **Geology as second major:** GLY 365, GLY 366 and GLY 367 (72 credits)
- **Meteorology as second major:** WKD 352, WKD 361, WKD 366 (72 credits) Unbalanced S1: 0, S2: 72
- **Astronomy, astrophysics and high energy physics:** PHY 300, PHY 310, WTW 383 (72 credits)
- **Interest in computational physics:** COS 314, COS 344, COS 333, COS 330 (72 credits).

*** All 5 modules are required if a student wishes to continue with BScHons Applied Mathematics, otherwise a selection of modules with a total number of 72 credits may be made.**

Core modules

Electronics, electromagnetism and quantum mechanics 356 (PHY 356) - Credits: 36.00
Statistical mechanics, solid state physics and modelling 364 (PHY 364) - Credits: 36.00

Elective modules

Physical chemistry 382 (CMY 382) - Credits: 18.00
Analytical chemistry 383 (CMY 383) - Credits: 18.00
Organic chemistry 384 (CMY 384) - Credits: 18.00
Inorganic chemistry 385 (CMY 385) - Credits: 18.00
Artificial intelligence 314 (COS 314) - Credits: 18.00
Computer security and ethics 330 (COS 330) - Credits: 18.00
Programming languages 333 (COS 333) - Credits: 18.00
Computer graphics 344 (COS 344) - Credits: 18.00
Structural geology 365 (GLY 365) - Credits: 18.00
Groundwater 366 (GLY 366) - Credits: 18.00
Economic geology 367 (GLY 367) - Credits: 36.00
Observational astronomy 300 (PHY 300) - Credits: 36.00
Particle and astroparticle physics 310 (PHY 310) - Credits: 18.00
Physics project 353 (PHY 353) - Credits: 12.00
Physics project 363 (PHY 363) - Credits: 12.00
The science of data analytics 353 (STK 353) - Credits: 25.00
Atmospheric vorticity and divergence 352 (WKD 352) - Credits: 18.00
Quasi-geostrophic analysis 361 (WKD 361) - Credits: 18.00
Fundamentals of weather forecasting 366 (WKD 366) - Credits: 36.00
Multivariate analysis 311 (WST 311) - Credits: 18.00
Stochastic processes 312 (WST 312) - Credits: 18.00
Time-series analysis 321 (WST 321) - Credits: 18.00
Analysis 310 (WTW 310) - Credits: 18.00
Complex analysis 320 (WTW 320) - Credits: 18.00
Algebra 381 (WTW 381) - Credits: 18.00
Dynamical systems 382 (WTW 382) - Credits: 18.00
Numerical analysis 383 (WTW 383) - Credits: 18.00
Partial differential equations 386 (WTW 386) - Credits: 18.00
Continuum mechanics 387 (WTW 387) - Credits: 18.00

Geometry 389 (WTW 389) - Credits: 18.00

BSc Plant Science (02133405)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Plant Science), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements Achievement level English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year

within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor's degree, will not receive credit for modules of which the content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.

- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12
Core = 128

Additional information:
Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 144

Minimum credits: 144

Students are required to select their modules on the basis of a chosen subject stream within the broader discipline of Plant Science. The choice of streams is as follows: Biodiversity (ecology & taxonomy), Medicinal Plant Science, Plant Pathology or a dual major in Plant Science and Biochemistry or Plant Science and Microbiology or Genetics. It is possible to register for other modules and configurations at the discretion of the relevant head of

department and as long as the timetable permits.

Biodiversity stream: GKD 250, GIS 221, MBY 251 and 261, ZEN 251 and 261; plus
(Sem 2) 12 credits: PLG 262 or PPK 251

Medicinal Plant Science stream: BCM 252 and 261, MBY 251 and 261, plus
(Sem 1) 12 credits (select one): CMY 284, PLG 251, ZEN 251
(Sem 2) 24 credits (select two): CMY 283, BCM 262, MBY 262, GIS 221

Plant Pathology stream: BCM 252 and 261, MBY 251 and 261, PLG 251 and 261 plus
(Sem 2) 12 credits (select one): GIS 221 or MBY 262

Plant Science in dual major with Microbiology or Genetics: BCM 252, 261, MBY 251, 261 and 262 plus
(Sem 1) 12 credits (select one): ZEN 251 or PLG 251
(Sem 2) 12 credits (select one): BCM 262, PLG 262 or ZEN 261

Plant Science in dual major with Biochemistry: BCM 252, 261 and 262, CMY 282, 283, 284 and 285.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00

Elective modules

Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Physical chemistry 282 (CMY 282) - Credits: 12.00
Analytical chemistry 283 (CMY 283) - Credits: 12.00
Organic chemistry 284 (CMY 284) - Credits: 12.00
Inorganic chemistry 285 (CMY 285) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00
African vertebrates 261 (ZEN 261) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits: 144

Core	=	90
Elective	=	54

Additional information:

Specialisation in Plant ecology: Students take suitable elective modules in the first semester and ZEN 364 (18 credits) in the second semester.
Specialisation in Plant Pathology: In the first semester, select PLG 351 and one module from [ZEN 355 or MBY 355], and in the second semester, select PLG 363 and replace [BOT 365 or BOT 366] with ZEN 365.

Dual major
Plant Science and Biochemistry: Replace BTC 361 in order to take BCM 356, BCM 357, BCM 367 and BCM 368.
Plant Science and Genetics: Select GTS 351, GTS 354 and GTS 367. Students may also choose to replace BOT 366 with GTS 368.
Plant Science and Microbiology: Replace BOT 366 in order to take MBY 351, MBY 355, MBY 364 and MBY 365.

Core modules
Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00

Elective modules
Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Population and evolutionary genetics 367 (GTS 367) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00
Virology 351 (MBY 351) - Credits: 18.00
Bacterial genetics 355 (MBY 355) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00
General plant pathology 351 (PLG 351) - Credits: 18.00
Plant disease control 363 (PLG 363) - Credits: 18.00
Insect diversity 355 (ZEN 355) - Credits: 18.00
Conservation ecology 364 (ZEN 364) - Credits: 18.00

BSc Zoology (02133399)

Minimum duration of study	3 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the

Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BSc (Zoology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes place over a period of four years instead of the normal three years.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the relevant head of department and subject to the permission by the Dean, select or replace prescribed module credits not indicated in BSc three-year study programmes to the equivalent of a maximum of 36 module credits.

It is important that the total number of prescribed module credits is completed during the course of the study programme. The Dean may, on the recommendation of the relevant head of department, approve deviations in this regard. Subject to the programmes as indicated in the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in a the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Students who are already in possession of a bachelor’s degree, will not receive credit for modules of which the

content overlap with modules from the degree that was already conferred. Credits will not be considered for more than half the credits passed previously for an uncompleted degree. No credits at the final-year or 300- and 400-level will be granted.

The Dean may, on the recommendation of the programme manager, approve deviations with regard to the composition of the study programme.

Please note: Where elective modules are not specified, these may be chosen from any modules appearing in the list of modules.

It remains the student's responsibility to acertain, prior to registration, whether they comply with the prerequisites of the modules they want to register for.

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

General promotion requirements in the faculty

All students whose academic progress is not acceptable can be suspended from further studies.

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Pass with distinction

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.

Curriculum: Year 1

Minimum credits: 140

Minimum credits:

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 148

Minimum credits:

Core = 136

Elective = 12

Additional information:

• Students interested in combining with Zoology in a dual major with Biochemistry or Genetics must take BCM 261 as an elective.
• Students interested in combining Zoology in a dual major with Biochemistry must also replace either BOT 261 or MBY 261 with BCM 262.

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Geographic information systems introduction 221 (GIS 221) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Invertebrate biology 251 (ZEN 251) - Credits: 12.00

African vertebrates 261 (ZEN 261) - Credits: 12.00

Elective modules

Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Food microbiology 262 (MBY 262) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00

Curriculum: Final year

Minimum credits: 144

Minimum credits:

Core = 144

Additional information:

Single major track
Students must take all eight modules listed in the fixed curriculum for the final year.
Dual major track
• **Zoology and Biochemistry combination**: Students must take [ZEN 352 + ZEN 354] and [ZEN 361 + ZEN 363] to a total value of 72 credits, and must take [BCM 356 and BCM 357] and [BCM 367 and BCM 368].
• **Zoology and Genetics combination:** Students must take [ZEN 352 + ZEN 354] and [ZEN 361 + ZEN 363] to a total value of 72 credits, and must take [GTS 351 and GTS 354] and [GTS 367 and either GTS 368 or BTC 361] to a value of 72 credits.
• **Zoology and Plant Science combination:** Students must take [ZEN 352 + ZEN 354] and [ZEN 362 + ZEN 353] to a total value of 72 credits, and must take [BOT 356 and BOT 358] and [BOT 366 and either BOT 365 or BTC 361] to a value of 72 credits.

Core modules

Population ecology 351 (ZEN 351) - Credits: 18.00
Mammalogy 352 (ZEN 352) - Credits: 18.00
Community ecology 353 (ZEN 353) - Credits: 18.00
Evolutionary physiology 354 (ZEN 354) - Credits: 18.00
Physiological processes 361 (ZEN 361) - Credits: 18.00
Evolution and phylogeny 362 (ZEN 362) - Credits: 18.00
Behavioural ecology 363 (ZEN 363) - Credits: 18.00
Conservation ecology 364 (ZEN 364) - Credits: 18.00

Elective modules

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356) - Credits: 18.00
Biocatalysis and integration of metabolism 357 (BCM 357) - Credits: 18.00
Cell structure and function 367 (BCM 367) - Credits: 18.00
Molecular basis of disease 368 (BCM 368) - Credits: 18.00

Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant ecology 358 (BOT 358) - Credits: 18.00
Phytomedicine 365 (BOT 365) - Credits: 18.00
Plant diversity 366 (BOT 366) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Eukaryotic gene control and development 351 (GTS 351) - Credits: 18.00
Genome evolution and phylogenetics 354 (GTS 354) - Credits: 18.00
Genetics in human health 368 (GTS 368) - Credits: 18.00

BScAgric Agricultural Economics and Agribusiness Management (02133410)

Minimum duration of study	4 years		
Contact	Prof SL Hendriks	sheryl.hendriks@up.ac.za	+27 (0)124203811
	Dr M van der Merwe	melissa.vandermerwe@up.ac.za	+27 (0)124204084

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BScAgric (Agricultural Economics and Agribusiness Management), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Compilation of curriculum
Students must register for elective modules in consultation with the head of department who must ensure that the modules do not clash on the set timetable.

The Dean may, in exceptional cases and on recommendation of the relevant head of department, approve deviations from the prescribed curriculum.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

Pass with distinction

The BScAgric degree is conferred with distinction if a student obtains a weighted average of at least 75% in the modules of the major subjects in the third and the fourth year of study, with a weighted average of at least 65% in the other modules of the third and the fourth year of study.

Curriculum: Year 1

Minimum credits: 130

Minimum credits:

Fundamental = 12

Core = 110

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students who do not qualify for STK 110 must register for STK 113 and STK 123

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Financial accounting 111 (FRK 111) - Credits: 10.00
Financial accounting 121 (FRK 121) - Credits: 12.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 125

Minimum credits:

Core = 125

Core modules

Economics 110 (EKN 110) - Credits: 10.00
Economics 120 (EKN 120) - Credits: 10.00
Introduction to food science and technology 250 (FST 250) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Agricultural economics 220 (LEK 220) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00
Statistics 110 (STK 110) - Credits: 13.00
Statistics 120 (STK 120) - Credits: 13.00
Animal science 250 (VKU 250) - Credits: 8.00
Animal Science 260 (VKU 260) - Credits: 8.00

Curriculum: Year 3

Minimum credits: 132

Minimum credits: 132

Core = 132

Core modules

Communication 421 (AGV 421) - Credits: 16.00
Business law 210 (BER 210) - Credits: 16.00
Economics 224 (EKN 224) - Credits: 16.00
Economics 244 (EKN 244) - Credits: 16.00

Principles and practices 351 (HSC 351) - Credits: 14.00
Agricultural economics 310 (LEK 310) - Credits: 12.00
Agricultural economics 320 (LEK 320) - Credits: 16.00
Statistics 210 (STK 210) - Credits: 20.00
Statistics 220 (STK 220) - Credits: 20.00

Curriculum: Final year

Minimum credits: 143

Minimum credits: 143

Core = 123

Electives = 20

Core modules

Agriculture and rural development studies 480 (ARD 480) - Credits: 32.00
Economics 314 (EKN 314) - Credits: 20.00
Agricultural market and price analysis 410 (LEK 410) - Credits: 20.00
Agricultural economics 415 (LEK 415) - Credits: 16.00
Agricultural economics 421 (LEK 421) - Credits: 20.00
Introduction to resource economics 424 (LEK 424) - Credits: 15.00

Elective modules

Vegetable crops 410 (AGR 410) - Credits: 15.00
Economics 325 (EKN 325) - Credits: 20.00
Statistics 310 (STK 310) - Credits: 25.00
Statistics 320 (STK 320) - Credits: 25.00
The science of data analytics 353 (STK 353) - Credits: 25.00
Principles of veld management 310 (WDE 310) - Credits: 12.00
Planted pastures and fodder crops 320 (WDE 320) - Credits: 12.00
Wildlife science 420 (WKE 420) - Credits: 8.00

BScAgric Animal Science (02133411)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BScAgric (Animal Science), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences
Minimum requirements
Achievement level

English Home Language or English First Additional Language		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Compilation of curriculum
Students must register for elective modules in consultation with the head of department who must ensure that the modules do not clash on the set timetable.

The Dean may, in exceptional cases and on recommendation of the relevant head of department, approve deviations from the prescribed curriculum.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

Pass with distinction

The BScAgric degree is conferred with distinction if a student obtains a weighted average of at least 75% in the modules of the major subjects in the third and the fourth year of study, with a weighted average of at least 65% in the other modules of the third and the fourth year of study.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intending to apply for the **BVSc** selection have to enrol for MTL 180(12)

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 147

Minimum credits: 147

Core = 147

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Carbohydrate metabolism 252 (BCM 252) - Credits: 12.00
Lipid and nitrogen metabolism 261 (BCM 261) - Credits: 12.00
Biochemical principles of nutrition and toxicology 262 (BCM 262) - Credits: 12.00
Animal anatomy and physiology 200 (DAF 200) - Credits: 32.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00

Animal science 250 (VKU 250) - Credits: 8.00
Animal Science 260 (VKU 260) - Credits: 8.00

Curriculum: Year 3

Minimum credits: 140

Minimum credits: 140

Core = 140

Core modules

Biometry 210 (BME 210) - Credits: 24.00
Animal physiology 311 (DFS 311) - Credits: 10.00
Growth physiology 320 (DFS 320) - Credits: 12.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Reproduction science 310 (RPL 310) - Credits: 8.00
Reproduction science 320 (RPL 320) - Credits: 10.00
Animal breeding 320 (TLR 320) - Credits: 12.00
Nutrition science 310 (VGE 310) - Credits: 14.00
Nutrition Science 320 (VGE 320) - Credits: 14.00
Principles of veld management 310 (WDE 310) - Credits: 12.00
Planted pastures and fodder crops 320 (WDE 320) - Credits: 12.00

Curriculum: Final year

Minimum credits: 133

Minimum credits: 133

Core = 133

Core modules

Large stock nutrition and production 420 (GVK 420) - Credits: 18.00
Small stock nutrition and production 420 (KVK 420) - Credits: 18.00
Poultry nutrition and production 420 (PVK 420) - Credits: 18.00
Animal breeding 411 (TLR 411) - Credits: 12.00
Applied animal breeding 420 (TLR 420) - Credits: 12.00
Monogastric nutrition and production 411 (VGE 411) - Credits: 16.00
Research methodology 400 (VKU 400) - Credits: 16.00
Meat and dairy science 420 (VSX 420) - Credits: 8.00
Advanced pasture science 450 (WDE 450) - Credits: 15.00

BScAgric Applied Plant and Soil Sciences (02133431)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is

deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.

- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BScAgric (Applied Plant and Soil Sciences), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences						
Minimum requirements						
Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Compilation of curriculum

Students must register for elective modules in consultation with the head of department who must ensure that the modules do not clash on the set timetable.

The Dean may, in exceptional cases and on recommendation of the relevant head of department, approve deviations from the prescribed curriculum.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that

it will fit in with both the lecture and examination timetable.

Pass with distinction

The BScAgric degree is conferred with distinction if a student obtains a weighted average of at least 75% in the modules of the major subjects in the third and the fourth year of study, with a weighted average of at least 65% in the other modules of the third and the fourth year of study.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Students intending to apply for the **BVSc** selection have to enrol for MTL 180(12)

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 135

Minimum credits: 135

Core = 135

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
South African flora and vegetation 251 (BOT 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00

Introductory soil science 250 (GKD 250) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Agricultural economics 220 (LEK 220) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00

Curriculum: Year 3

Minimum credits: 148

Minimum credits: 148

Core = 148

Core modules

Field crops 361 (AGR 361) - Credits: 14.00
Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Soil chemistry 320 (GKD 320) - Credits: 14.00
Soil classification and surveying 350 (GKD 350) - Credits: 14.00
Principles and practices 351 (HSC 351) - Credits: 14.00
Soil-water relationship and irrigation 350 (PGW 350) - Credits: 14.00
Plant disease control 363 (PLG 363) - Credits: 18.00
Principles of veld management 310 (WDE 310) - Credits: 12.00
Planted pastures and fodder crops 320 (WDE 320) - Credits: 12.00
Applied entomology 365 (ZEN 365) - Credits: 18.00

Curriculum: Final year

Minimum credits: 150

Minimum credits: 150

Core = 150

Core modules

Vegetable crops 410 (AGR 410) - Credits: 15.00
Crop physiology 461 (APS 461) - Credits: 15.00
Soil fertility, soil microbiology and plant nutrition 420 (GKD 420) - Credits: 15.00
Fruit tree crops 420 (HSC 420) - Credits: 15.00
Ornamental horticulture 490 (HSC 490) - Credits: 15.00
Environmental biophysics 450 (LKM 450) - Credits: 15.00
Weed science 413 (OKW 413) - Credits: 15.00
Seminar 400 (PGW 400) - Credits: 15.00
Experimental design and analysis 421 (PGW 421) - Credits: 15.00
Advanced pasture science 450 (WDE 450) - Credits: 15.00

BScAgric Plant Pathology (02133433)

Minimum duration of study	4 years

Admission requirements

- The following persons will be considered for admission: a candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required Grade 12 certificate with university endorsement, a candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution, and a candidate who is a graduate of another faculty at the University of Pretoria.
- Life Orientation is excluded in the calculation of the Admission Point Score (APS).
- Grade 11 results are used for the conditional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	**30**

* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission.

Candidates who do not comply with the minimum admission requirements for BScAgric (Plant Pathology), may be considered for admission to the BSc – Extended programme for the Biological and Agricultural Sciences. The BSc – Extended programme takes one year longer to complete.

BSc Extended Programme for the Biological and Agricultural Sciences Minimum requirements Achievement level						
English Home Language or English First Additional Language		**Mathematics**		**Physical Science**		**APS**
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	**24**

Other programme-specific information

Electives are chosen as follows:

Third year – 12 credits

Compilation of curriculum

Students must register for elective modules in consultation with the head of department who must ensure that the modules do not clash on the set timetable.

The Dean may, in exceptional cases and on recommendation of the relevant head of department, approve deviations from the prescribed curriculum.

Promotion to next study year

A student will be promoted to the following year of study if he or she passed 100 credits of the prescribed credits for a year of study, unless the Dean on the recommendation of the relevant head of department decides otherwise. A student who does not comply with the requirements for promotion to the following year of study, retains the credit for the modules already passed and may be admitted by the Dean, on recommendation of the relevant head of department, to modules of the following year of study to a maximum of 48 credits, provided that it will fit in with both the lecture and examination timetable.

Pass with distinction

The BScAgric degree is conferred with distinction if a student obtains a weighted average of at least 75% in the modules of the major subjects in the third and the fourth year of study, with a weighted average of at least 65% in the other modules of the third and the fourth year of study.

Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140

Fundamental = 12

Core = 128

Additional information:

Students who do not qualify for AIM 102 must register for AIM 111 and AIM 121.

Fundamental modules

Academic information management 102 (AIM 102) - Credits: 6.00
Academic information management 111 (AIM 111) - Credits: 4.00
Academic information management 121 (AIM 121) - Credits: 4.00
Language and study skills 110 (LST 110) - Credits: 6.00
Academic orientation 102 (UPO 102) - Credits: 0.00

Core modules

Biometry 120 (BME 120) - Credits: 16.00
Plant biology 161 (BOT 161) - Credits: 8.00
General chemistry 117 (CMY 117) - Credits: 16.00
General chemistry 127 (CMY 127) - Credits: 16.00
Introductory genetics 161 (GTS 161) - Credits: 8.00
Introduction to microbiology 161 (MBY 161) - Credits: 8.00
Molecular and cell biology 111 (MLB 111) - Credits: 16.00
Physics for biology students 131 (PHY 131) - Credits: 16.00
Mathematics 134 (WTW 134) - Credits: 16.00
Animal diversity 161 (ZEN 161) - Credits: 8.00

Curriculum: Year 2

Minimum credits: 147

Minimum credits: 147

Core = 147

Core modules

Introduction to proteins and enzymes 251 (BCM 251) - Credits: 12.00
Plant physiology and biotechnology 261 (BOT 261) - Credits: 12.00
Introductory soil science 250 (GKD 250) - Credits: 12.00
Molecular genetics 251 (GTS 251) - Credits: 12.00
Genetic diversity and evolution 261 (GTS 261) - Credits: 12.00
Introduction to agricultural economics 210 (LEK 210) - Credits: 12.00
Agricultural economics 220 (LEK 220) - Credits: 12.00
Bacteriology 251 (MBY 251) - Credits: 12.00
Mycology 261 (MBY 261) - Credits: 12.00
Introduction to crop protection 251 (PLG 251) - Credits: 12.00
Principles of plant pathology 262 (PLG 262) - Credits: 12.00
Sustainable crop production and agroclimatology 251 (PPK 251) - Credits: 15.00

Curriculum: Year 3

Minimum credits: 140

Minimum credits: 140

Core = 140

Core modules

Plant ecophysiology 356 (BOT 356) - Credits: 18.00
Plant genetics and crop biotechnology 361 (BTC 361) - Credits: 18.00
Principles and practices 351 (HSC 351) - Credits: 14.00
Virology 351 (MBY 351) - Credits: 18.00
Genetic manipulation of microbes 364 (MBY 364) - Credits: 18.00
Microbe interactions 365 (MBY 365) - Credits: 18.00
General plant pathology 351 (PLG 351) - Credits: 18.00
Plant disease control 363 (PLG 363) - Credits: 18.00

Curriculum: Final year

Minimum credits: 145

Minimum credits: 145

Core = 145

Core modules

Weed science 413 (OKW 413) - Credits: 15.00

Seminar 400 (PGW 400) - Credits: 15.00
Experimental design and analysis 421 (PGW 421) - Credits: 15.00
Research project 462 (PLG 462) - Credits: 28.00
Plant disease epidemiology 463 (PLG 463) - Credits: 18.00
Advanced plant disease control 483 (PLG 483) - Credits: 18.00
Current concepts in plant pathology 490 (PLG 490) - Credits: 18.00
Applied entomology 365 (ZEN 365) - Credits: 18.00

Honours

BAgricHons Extension (02241000)

Minimum duration of study	1 year

Programme information

The aim of this degree programme is to produce graduates qualified to operate as professional extension or development agents. On completion of the degree the candidate will be able to design, develop and execute or manage scientifically sound situation-specific and community adapted extension or development programmes, conforming to the principles of participatory development with maximum community involvement and impact.

To enable them to do this they should:

- be aware and knowledgeable of the philosophies and the different concepts and approaches of development and extension as well as its organisation and management;
- have an understanding of the principles of human behaviour with specific reference to decision making and behaviour change and the theories involved in understanding and facilitating change;
- be knowledgeable of the theory and practical implementation of community development, group dynamics and leadership for the formulation and execution of development plans;
- have an understanding of the principles of communication and be skilful in the identification and use of the most appropriate communication methods and combinations thereof;
- be knowledgeable and skilled in the development, execution and evaluation of situation-specific extension programmes;
- have the ability to conduct and report a research study under supervision, in a manner that is appropriate to the discipline of the field of study.

Admission requirements

In order to be accepted for the BAgricHons studies, a candidate must be in possession of an acceptable bachelor's degree. An average of 60% is required for admission. An entrance examination is necessary, although exemption may be granted under certain circumstances, as determined by the head of the department. Specified modules, in addition to the honours modules, may be required,as determined by the head of department(s) in the candidate's proposed field of specialisation.

Other programme-specific information

A module in Agricultural economics or any other field of specialisation may be included as an elective module, in consultation with the head(s) of department(s).

Elective coursework that may be required will be decided upon by the head(s) of the particular department(s).

Additional required modules as prescribed for the specific fields of specialisation will be jointly determined by the head(s) of the particular department(s) in question.

Examinations and pass requirements

In order to obtain the degree, the candidate must achieve a minimum of 50% in each of the prescribed modules.

Pass with distinction

An average of 75% in all the prescribed modules must be obtained in order to pass the degree with distinction.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Other programme-specific information:

- A module in Agricultural economics or any other field of specialisation may be included as an elective module, in consultation with the head(s) of department(s).
- Elective coursework that may be required will be decided upon by the head(s) of the particular department(s).
- Additional required modules as prescribed for the specific fields of specialisation will be jointly determined by the head(s) of the particular department(s) in question.

Core modules

Leadership and group dynamics 712 (AGV 712) - Credits: 20.00
Communication for sustainable rural development 713 (AGV 713) - Credits: 15.00
Principles and approaches of rural development and extension 715 (AGV 715) - Credits: 15.00
Extension programme planning and management 726 (AGV 726) - Credits: 20.00
Extension programme evaluation and research 728 (AGV 728) - Credits: 30.00
Human and organisational behaviour change and management 729 (AGV 729) - Credits: 20.00
Research project: Rural development studies 780 (ARD 780) - Credits: 30.00

BAgricHons Rural Development (02241002)

Minimum duration of study	1 year

Programme information

This programme is coordinated in the Department of Agricultural Economics, Extension and Rural Development.

The aim of this programme is to enable graduates to participate in and lead rural development processes and policy initiatives. It provides a broad-based understanding of rural development, including project planning and analysis and strategic management.

Admission requirements

In order to be accepted for the BAgricHons studies, a candidate must be in possession of an acceptable bachelor’s degree. An average of 60% is required for admission. An entrance examination is necessary, although exemption may be granted under certain circumstances, as determined by the head of the department. Specified modules, in addition to the honours modules, may be required, as determined by the head of department(s) in the candidate's proposed field of specialisation.

Examinations and pass requirements

In order to obtain the degree, the candidate must achieve a minimum of 50% in each of the prescribed modules.

Pass with distinction

An average of 75% in all the prescribed modules must be obtained in order to pass the degree with distinction.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core modules
Communication for sustainable rural development 713 (AGV 713) - Credits: 15.00
Principles and approaches of rural development and extension 715 (AGV 715) - Credits: 15.00
Research project: Rural development studies 780 (ARD 780) - Credits: 30.00
Research project 784 (ARD 784) - Credits: 30.00
Agribusiness management 720 (LEK 720) - Credits: 15.00
Agricultural project planning and appraisal 785 (LEK 785) - Credits: 15.00

Elective modules
Leadership and group dynamics 712 (AGV 712) - Credits: 20.00

BScAgricHons Crop Science (02241004)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

The admission requirement is a BScAgric (Applied Plant and Soil Sciences) degree or equivalent qualification, or an appropriate BSc degree after consultation with the Head of Department. A South African equivalent aggregate mark of 60% is required for all the modules taken in the final year of undergraduate studies. Students are selected on merit.

Other programme-specific information

Electives can be chosen out of the modules listed or any other 700-module that is presented in the Faculty of Natural and Agricultural Sciences, chosen in consultation with the Head of Department of Plant and Soil Science.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 60

Elective credits: 75

Core modules

Research project in crop science 701 (PGW 701) - Credits: 30.00
Scientific communication 702 (PGW 702) - Credits: 15.00
Research methodology 704 (PGW 704) - Credits: 15.00

Elective modules

Crop production systems (I): Field crops 785 (AGR 785) - Credits: 15.00
Crop production systems (II): Vegetable crops 786 (AGR 786) - Credits: 15.00
Crop physiology 761 (APS 761) - Credits: 15.00
Plant nutrition, soil biology and soil fertility 773 (GDK 773) - Credits: 15.00
Fruit tree crops 780 (HSC 780) - Credits: 30.00
Environmental biophysics 750 (LKM 750) - Credits: 15.00
Plant production: Herbicides and control 712 (PPR 712) - Credits: 15.00
Agroforestry 713 (PPR 713) - Credits: 15.00
Rangeland management 781 (WDE 781) - Credits: 15.00
Pasture science 782 (WDE 782) - Credits: 15.00

BScHons Actuarial Science (02240278)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

i) A relevant bachelor’s degree with Mathematical Statistics and Actuarial Science at 300 level.

(ii) An average of 60% for all modules at third-year level.

(iii) Exemption recommendations for at least five of the A100- and A200-level subjects of the Actuarial Society of South Africa.

(iv) IAS 353 Contingencies.

(v) Students from other accredited institutions must comply with the same requirements based on equivalent modules at their institutions. In addition, students from other accredited institutions might also be required to pass an entrance evaluation.

(vi) Student numbers are limited. Selection is based on performance in the prior degree, on condition that the minimum requirements are met as set out in (i) to (iv) above.

(vii) Historical performance during prior studies will also be considered in selecting students. Specific attention will be given to modules repeated and duration of study.

(viii) Any additional entrance requirements as specified by the head of department in consultation with the departmental postgraduate selection committee.

Other programme-specific information

To qualify for this degree, the candidate must successfully complete a total of at least 135 credits, made up from modules from the curriculum in collaboration with, and subject to, the approval of the Head of the Department of Actuarial Science.

Promotion to next study year

The progress of all honours candidates is monitored biannually by the head of department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Fundamental credits: 30
Core credits: 75
Elective credit: 30

Core modules

Actuarial risk management 712 (IAS 712) - Credits: 50.00
Actuarial communication 722 (IAS 722) - Credits: 15.00
Research project 780 (NPN 780) - Credits: 30.00

Elective modules

Finance and investment 700 (FNI 700) - Credits: 40.00
Enterprise risk management 721 (IAS 721) - Credits: 40.00
Life assurance 700 (LEW 700) - Credits: 40.00

BScHons Applied Mathematics (02240172)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc in Mathematics, Applied Mathematics or equivalent Bachelor's degree with at least a 60% average in the final year Mathematics or Applied Mathematics subjects. The final year should include at least four of the following third-year level modules or equivalent: partial differential equations, dynamical systems (ordinary differential equations), real analysis, complex analysis, numerical analysis and continuum mechanics (UP modules WTW 386, WTW 382, WTW 310, WTW 320, WTW 383 or WTW 387). In the selection procedure the candidate's complete undergraduate academic record will be considered.

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 45

Elective credits: 90

Other programme-specific information:

The programme compilation consists of seven honours modules of 15 credits each as well as the mandatory project (30 credits). It is required that students select the stream and elective modules according to the prerequisites of the modules.

- Stream 1: Applied analysis
- Stream 2: Differential equations and modelling

Core modules

Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00
Project 795 (WTW 795) - Credits: 30.00

Elective modules

Functional analysis 710 (WTW 710) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00
Main principles of analysis in application 735 (WTW 735) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Continuum mechanics 787 (WTW 787) - Credits: 15.00

BScHons Biochemistry (02240701)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate BSc degree with a final grade point average (GPA) of at least 60% and at least 60% in Biochemistry at 300-level.Admission is furthermore contingent on the availability of supervisors and/or research projects within the department.

Other programme-specific information

- A pass mark is required for all the components of the honours programme and the average mark is calculated proportionally to the credits.
- Additional modules can be prescribed to remedy shortcomings in a candidate’s undergraduate training.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core modules

Trends in biochemical research 771 (BCM 771) - Credits: 15.00
Research project and report 773 (BCM 773) - Credits: 60.00
Research methods 774 (BCM 774) - Credits: 30.00
Advanced biochemistry 775 (BCM 775) - Credits: 15.00
Molecular and cellular biology 721 (MLB 721) - Credits: 15.00

BScHons Bioinformatics (02240702)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

Students must be in possession of a bachelor's degree in bioinformatics, biological sciences, computer science, informatics, mathematics, mathematical statistics or computer engineering. Students with a bachelor's degree in either physics, mathematics, mathematical statistics or electronic engineering may be required to do a special postgraduate bridging year before admission to BScHons in Bioinformatics. Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 120

Elective credit: 15

Other programme-specific information:

Students with degrees in biological sciences should choose BME 780 as an elective. Students from computer science and other related backgrounds should choose BIF 704. Other additional modules may be prescribed for non-degree purposes to address shortcomings in a candidate's undergraduate training.

Core modules

Bioinformatics theory and applications 701 (BIF 701) - Credits: 30.00
Trends in bioinformatics and literature seminar 702 (BIF 702) - Credits: 15.00
Research project and report 703 (BIF 703) - Credits: 60.00
Molecular and cellular biology 721 (MLB 721) - Credits: 15.00

Elective modules

Introduction to molecular biology for bioinformatics 704 (BIF 704) - Credits: 15.00
Statistics for biological sciences 780 (BME 780) - Credits: 15.00

BScHons Biotechnology (02240393)

Minimum duration of study	1 year

Programme information

BScHons (Biotechnology) is a unique interdepartmental programme aimed at enabling students to pursue their interest in molecular biotechnology through relevant research areas offered within fields of biochemistry, plant science, microbiology and plant pathology, plant production, as well as genetics. Students within this programme will be registered and will conduct their studies within the department of their choice. A student's choice of research programme will determine which of the respective departments will mentor their honours degree programme.

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

- BSc in Biotechnology or equivalent degree including at least three final-year modules with a strong molecular biology focus. The following UP modules or their equivalent will be considered: GTS 351, GTS 354, GTS 368, BCM 356, MBC 357, BCM 367, MBY 355, MBY 364, MBY 365, BTC 361.
- Students must have completed four final-year modules in the disciplinary field within which the honours degree will be registered.

- An average pass mark of 60% or more at final-year level or permission by the head of department. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination.
- Admission is furthermore contingent on the availability of supervisors and/or research projects within the participating departments.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Fundamental credit: 16

Core credits: 30

Elective credits: 105

Other programme-specific information:

- The curriculum for the balance of the credits will be determined by the heads of the participating departments.
- Additional modules may be prescribed by the head of the department where deemed necessary. Honours students may also be required to complete a biometry or equivalent module, if they have not already done so during their undergraduate training.

Core modules

Biotechnology in the workplace 701 (BTW 701) - Credits: 15.00
Molecular and cellular biology 721 (MLB 721) - Credits: 15.00

Elective modules

Research project and report 773 (BCM 773) - Credits: 60.00
Research methods 774 (BCM 774) - Credits: 30.00
Molecular techniques 705 (BOT 705) - Credits: 15.00
Research report 782 (BOT 782) - Credits: 60.00
Research project 703 (GTK 703) - Credits: 60.00
Research methods 705 (GTK 705) - Credits: 30.00
Research methods 751 (MCP 751) - Credits: 30.00
Research project and literature study 754 (MCP 754) - Credits: 60.00

BScHons Chemistry (02240123)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.

ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate BSc degree with at least 60% for Chemistry at 300-level.

Examinations and pass requirements

A final mark of 50% for each module. To continue to a second semester, a minimum of 40% is required in each module in the first semester. The registration of students who do not meet this requirement will be terminated at the end of the first semester.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core modules

Analytical chemistry A 706 (CMY 706) - Credits: 10.00
Analytical chemistry B 707 (CMY 707) - Credits: 10.00
Organic chemistry A 708 (CMY 708) - Credits: 10.00
Organic chemistry B 709 (CMY 709) - Credits: 10.00
Inorganic chemistry A 714 (CMY 714) - Credits: 10.00
Inorganic chemistry B 715 (CMY 715) - Credits: 10.00
Physical chemistry A 716 (CMY 716) - Credits: 10.00
Physical chemistry B 717 (CMY 717) - Credits: 10.00
Research: Organic/inorganic project Part 1 718 (CMY 718) - Credits: 20.00
Research: Physical/analytical project Part 2 719 (CMY 719) - Credits: 20.00
Advanced practical techniques 730 (CMY 730) - Credits: 15.00

BScHons Engineering and Environmental Geology Engineering Geology (02240375)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc degree in Geology or Environmental and Engineering Geology with an average of 60% for all the modules in applied geology at second-year and third-year level. These modules must include soil mechanics, rock mechanics, engineering geology and hydrogeology. In the selection procedure the candidate's complete undergraduate academic record will be considered. The positions available are limited to 15 and candidates who have progressed faster through their undergraduate degree will take preference. Outside applicants and those with unusual degree structures may be admitted after perusal of their academic records and at the discretion of the head of department.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 117

Elective credits: 18

Core modules

Site investigation project 713 (GTX 713) - Credits: 30.00
Engineering geology of South Africa 714 (GTX 714) - Credits: 15.00
Environmental management and risk assessment 716 (GTX 716) - Credits: 15.00
Construction materials 721 (GTX 721) - Credits: 15.00
Rock engineering 722 (GTX 722) - Credits: 15.00
Engineering applications 723 (GTX 723) - Credits: 15.00
Fluid mechanics in geological media 725 (GTX 725) - Credits: 15.00

Elective modules

Environmental geochemistry 715 (GTX 715) - Credits: 15.00
Rock and soil improvement 726 (GTX 726) - Credits: 15.00

BScHons Engineering and Environmental Geology Hydrogeology (02240376)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc degree in Geology or Environmental and Engineering Geology with an average of 60% for all the modules in applied geology at second-year and third-year level. These modules must include soil mechanics, rock mechanics, engineering geology and hydrogeology. In the selection procedure the candidate's complete undergraduate academic record will be considered. The positions available are limited to 15 and candidates who have progressed faster through their undergraduate degree will take preference. Outside applicants and those with unusual degree structures may be admitted after perusal of their academic records and at the discretion of the head of department.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 117

Elective credits: 18

Core modules

Site investigation project 713 (GTX 713) - Credits: 30.00
Engineering geology of South Africa 714 (GTX 714) - Credits: 15.00
Environmental geochemistry 715 (GTX 715) - Credits: 15.00
Environmental management and risk assessment 716 (GTX 716) - Credits: 15.00
Hydrogeological modelling 718 (GTX 718) - Credits: 15.00
Contaminant transport 719 (GTX 719) - Credits: 15.00
Fluid mechanics in geological media 725 (GTX 725) - Credits: 15.00

Elective modules

Rock engineering 722 (GTX 722) - Credits: 15.00
Rock and soil improvement 726 (GTX 726) - Credits: 15.00

BScHons Entomology (02240704)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

In addition to the requirements of General Regulations G.1.3 and G.62, an appropriate bachelor's degree is a prerequisite: a candidate with an average of less than 65% in the major subjects in the final year of the bachelor’s degree, will only be admitted with the approval of the Dean on the recommendation of the Head of Department. Additional conditions may be prescribed by the head of Department.

Examinations and pass requirements

A pass mark is required for all the components of the honours study programme.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits:	135
Core credits:	81
Elective credits:	54

Core modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Research project 701 (ZEN 701) - Credits: 68.00
Research methods and scientific communication 713 (ZEN 713) - Credits: 13.00

Elective modules

Systematics, evolution and biogeography 703 (ZEN 703) - Credits: 13.00
Environmental physiology 704 (ZEN 704) - Credits: 13.00
Principles in applied ecology 705 (ZEN 705) - Credits: 13.00
Integrated pest management in Africa 707 (ZEN 707) - Credits: 13.00
Mammal ecology 710 (ZEN 710) - Credits: 13.00
Behavioural ecology 712 (ZEN 712) - Credits: 13.00
Insect-plant interactions 782 (ZEN 782) - Credits: 13.00
Global climate change and biodiversity 783 (ZEN 783) - Credits: 13.00
Contemporary research techniques 784 (ZEN 784) - Credits: 13.00

BScHons Financial Engineering (02240277)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate bachelor's degree with a minimum of 60% for all modules on third-year level. In the selection procedure the candidates complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Calculus, Differential equations and Linear algebra on second-year level (each with a mark of at least 60%).

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 91
Elective credits: 44

The Postgraduate Coordinator has to approve the final programme composition for this programme.

1. Students who have included Statistics, Mathematical Statistics or Industrial Engineering in their undergraduate degree programme, will not be allowed to take BAN 780. Additional modules from the list of electives should be included in the programme composition.
2. Lectures for BAN 780 and ISE 780 are scheduled in “blocks” – consult the relevant departments at the Faculty of Engineering, Built Environment and Information Technology.
3. WTW 732 and WTW 762 will be presented weekly as well as some extra “block” lectures.
4. TRA 720 not allowed for students who have already passed the UP module WST 321 (or equivalent) at undergraduate level.

Core modules

Industrial analysis 780 (BAN 780) - Credits: 16.00
Mathematical models of financial engineering 732 (WTW 732) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Mathematical models of financial engineering 762 (WTW 762) - Credits: 15.00
Project 792 (WTW 792) - Credits: 30.00

Elective modules

Systems thinking and engineering 780 (ISE 780) - Credits: 16.00
Linear models 710 (LMO 710) - Credits: 15.00
Linear models 720 (LMO 720) - Credits: 15.00
Multivariate analysis 710 (MVA 710) - Credits: 15.00
Multivariate analysis 720 (MVA 720) - Credits: 15.00
Modern portfolio theory 712 (WTW 712) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Main principles of analysis in application 735 (WTW 735) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00

BScHons Food Science (02240602)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc in Food Science degree with a pass mark of at least 60%. A candidate with another, applicable academic background can be admitted to the programme on passing a preliminary examination and/or on completion of certain prescribed modules aimed at supplementing lacking background knowledge.

Other programme-specific information

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 105

Elective credits 30

Core modules

Research methodology and seminars 700 (FST 700) - Credits: 15.00
Sensory evaluation 712 (FST 712) - Credits: 10.00
Production development and quality management 713 (FST 713) - Credits: 25.00
Advanced food science 720 (FST 720) - Credits: 15.00
Research project 763 (FST 763) - Credits: 40.00

BScHons Genetics (02240705)

Minimum duration of study	1 year

Programme information

The honours study programmes serve as the first level of postgraduate training and the aim is therefore to introduce students to the methods of research – from the reading of research papers, through to the conceptualisation, planning, execution and communication of a research project.

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances,

the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate BSc degree with a final grade point average (GPA) of at least 60% and including at least four genetics modules at final-year level or permission by the Head of Department. Preference will be given to applicants with the highest final GPAs for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the Department.

Examinations and pass requirements

A pass mark is required for all the components of the honours study programme and the final honours mark is calculated proportionally to the credits of the respective prescribed modules.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Other programme-specific information:

- Additional modules may be prescribed by the head of the department where deemed necessary. Honours students may also be required to complete a biometry or equivalent module, if they have not already done so during their undergraduate training.
- Suitably qualified candidates may also apply for the interdepartmental BScHons in Biotechnology (Code 02240393) with a registration in the Department of Genetics. For more information, please refer to the programme information for the BScHons in Biotechnology.

Core modules

Seminar course 702 (GTK 702) - Credits: 15.00
Research project 703 (GTK 703) - Credits: 60.00
Trends in genetics 704 (GTK 704) - Credits: 15.00
Research methods 705 (GTK 705) - Credits: 30.00
Molecular and cellular biology 721 (MLB 721) - Credits: 15.00

BScHons Geography and Environmental Science (02240415)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate bachelor's degree, with an overall average of 60% for 300- and 400-level modules. Prospective students may be required to do additional modules to enable them to reach the desired level of study. Selection takes place before admission.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Fundamental credit: 25

Core credits: 35

Elective credits: 75

Other programme-specific information:

Please note that the curriculum may change each year at the discretion of the head of department or the honours coordinator in the Department of Geography, Geoinformatics and Meteorology.

Appropriate modules, other than approved by the honours coordinator or head of department, may be taken. However, a minimum of 45 elective module credits should come from the Department of Geography, Geoinformatics and Meteorology.

Fundamental modules

Geographical and environmental principles 710 (GGY 710) - Credits: 25.00

Core modules

Research project 702 (GGY 702) - Credits: 35.00

Elective modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Natural woodland and forests: Ecology and management 700 (BOT 700) - Credits: 15.00
Basis in environmental health 772 (EHM 772) - Credits: 5.00
Environmental assessments 785 (ENV 785) - Credits: 15.00

Introduction to environmental and occupational health 775 (EOH 775) - Credits: 10.00
Selected theme 701 (GGY 701) - Credits: 15.00
Applied geomorphology 718 (GGY 718) - Credits: 15.00
Urban geography 780 (GGY 780) - Credits: 15.00
Environmental change 789 (GGY 789) - Credits: 15.00
Aspects of land reform and the environment 793 (GGY 793) - Credits: 15.00
Advanced remote sensing 705 (GMA 705) - Credits: 15.00
Environmental management and risk assessment 716 (GTX 716) - Credits: 15.00
Responsible ecotourism management 714 (TBE 714) - Credits: 20.00

BScHons Geoinformatics (02240414)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc in Geoinformatics or equivalent BSc degree that meets the prerequisites of the honours modules. Prospective students may be required to do additional modules to enable them to reach the desired level of study. Selection takes place before admission.

Additional requirements

Prospective students may be required to do additional modules to enable them to reach the desired level of study. Selection takes place before admission.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits 135

Fundamental credits: 25

Core credits: 80

Elective credits: 30

Other programme-specific information:

Appropriate honours modules may be taken from the Faculty or from the School of Information Technology, as approved by the honours coordinator or relevant head of department.

Two elective modules should be selected, of which one must be either COS 787 or GIS 706.

Fundamental modules

Research methods 701 (GIS 701) - Credits: 10.00
GIS professional practice 703 (GIS 703) - Credits: 15.00

Core modules

Research project 702 (GIS 702) - Credits: 35.00
Spatial statistics and geodesy 704 (GIS 704) - Credits: 15.00
Advanced geospatial data 705 (GIS 705) - Credits: 15.00
Advanced remote sensing 705 (GMA 705) - Credits: 15.00

Elective modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Natural woodland and forests: Ecology and management 700 (BOT 700) - Credits: 15.00
Spatial databases 787 (COS 787) - Credits: 15.00
Basis in environmental health 772 (EHM 772) - Credits: 5.00
Introduction to environmental and occupational health 775 (EOH 775) - Credits: 10.00
Internet GIS 706 (GIS 706) - Credits: 15.00
Special topics 707 (GIS 707) - Credits: 15.00
Environmental management and risk assessment 716 (GTX 716) - Credits: 15.00
Responsible ecotourism management 714 (TBE 714) - Credits: 20.00

BScHons Geology (02240142)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

A BSc degree in Geology with an average of 60% for all the geology modules at third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. The positions available are limited to 25 and candidates who have progressed faster through their undergraduate degree will take preference. Outside applicants and those with unusual degree structures may be admitted after perusal of their academic records and at the discretion of the head of department.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core modules

Volcanology 702 (GLY 702) - Credits: 12.00
Geophysics and basin analysis 703 (GLY 703) - Credits: 16.00
Crustal evolution 704 (GLY 704) - Credits: 12.00
Ore deposits and mining methods 706 (GLY 706) - Credits: 16.00
Mapping camp 707 (GLY 707) - Credits: 9.00
Honours project 710 (GLY 710) - Credits: 30.00
Igneous petrology and geochemistry 711 (GLY 711) - Credits: 12.00
Metamorphic petrology and geochemistry 712 (GLY 712) - Credits: 12.00
Economic geology 713 (GLY 713) - Credits: 16.00

BScHons Mathematical Statistics (02240192)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

- A relevant bachelor's degree with Mathematical Statistics on the 300-level is required.
- For BScHons in Mathematical Statistics, an average mark of 65% or more

  (i) in Mathematical statistics on the 300-level or

  (ii) in an equivalent statistical module(s) at an accredited institution is required.
- In addition to passing of the core modules, WST 312 is also required as prerequisite for BScHons and BComHons in Mathematical Statistics.
- Students from other accredited institutions must comply with the same requirements based on equivalent modules at their institutions. In addition, students from other accredited institutions must also pass an entrance evaluation.
- Student numbers are limited to a maximum of 40, collectively over all honours programmes in the Department of Statistics. Selection is based on performance in the prior degree, conditional on ii and iii above.
- Historical performance during prior studies will also be considered in selecting students. Specific attention will be given to modules repeated and duration of study.
- Any additional entrance requirements as specified by the head of department in consultation with the departmental postgraduate selection committee.
- International qualifications have to be evaluated by SAQA.

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 60

Elective credits: 75

Core modules

Linear models 710 (LMO 710) - Credits: 15.00
Multivariate analysis 710 (MVA 710) - Credits: 15.00
Research orientation 796 (STK 796) - Credits: 0.00
Research report: Mathematical statistics 795 (WST 795) - Credits: 30.00

Elective modules

Introduction to statistical learning 720 (EKT 720) - Credits: 15.00
Linear models 720 (LMO 720) - Credits: 15.00
Multivariate analysis 720 (MVA 720) - Credits: 15.00

Parametric stochastic processes 720 (PNP 720) - Credits: 15.00
Sampling techniques 720 (SFT 720) - Credits: 15.00
Statistical process control 780 (SPC 780) - Credits: 15.00
Linear mixed models 781 (STK 781) - Credits: 15.00
Distribution-free methods 710 (VMT 710) - Credits: 15.00

BScHons Mathematics (02240182)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate BSc or equivalent Bachelor's degree with a minimum of 60% for all Mathematics/Applied mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed real analysis and algebra on third-year level each with a mark of at least 60% (UP modules WTW 310 and WTW 381).

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 105

Elective credits: 30

Core modules

Functional analysis 710 (WTW 710) - Credits: 15.00
Axiomatic set theory and mathematical logic 724 (WTW 724) - Credits: 15.00
Algebra 731 (WTW 731) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00
Topology 790 (WTW 790) - Credits: 15.00
Project 795 (WTW 795) - Credits: 30.00

Elective modules

Special topics 727 (WTW 727) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00

BScHons Mathematics and Mathematics Education Algebra and Analysis (02240183)

Minimum duration of study	1 year

Programme information

The programme consists of seven honours modules (five modules of 15 credits each from the Department of Mathematics and Applied Mathematics and two modules of 16 credits each from the Department of Science, Mathematics and Technology Education) as well as the compulsory research project (30 credits). Elective modules should be selected according to the prerequisites of these modules.
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and other requirements for honours degrees.

Admission requirements

An appropriate BSc degree with a minimum of 60% for all Mathematics/Applied mathematics modules on third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed Real analysis and Algebra on third-year level (each with a mark of at least 60%).

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 137

Fundamental modules
Project 795 (WTW 795) - Credits: 30.00

Core modules
Mathematics and mathematical literacy education 730 (MCE 730) - Credits: 16.00
Educational research methodology 745 (NMQ 745) - Credits: 16.00
Functional analysis 710 (WTW 710) - Credits: 15.00
Axiomatic set theory and mathematical logic 724 (WTW 724) - Credits: 15.00
Algebra 731 (WTW 731) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00

Elective modules
Special topics 727 (WTW 727) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Main principles of analysis in application 735 (WTW 735) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00
Continuum mechanics 787 (WTW 787) - Credits: 15.00

BScHons Mathematics and Mathematics Education Applied Analysis (02240184)

Minimum duration of study	1 year

Programme information

The programme consists of seven honours modules (five modules of 15 credits each from the Department of Mathematics and Applied Mathematics and two modules of 16 credits each from the Department of Science, Mathematics and Technology Education) as well as the compulsory research project (30 credits). Elective modules should be selected according to the prerequisites of these modules.
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and other requirements for honours degrees.

Admission requirements

A BSc in Mathematics, Applied Mathematics or equivalent degree with at least a 60% average in the final year Mathematics or Applied Mathematics subjects. The final year should include at least four of the following third-year level modules or equivalent: partial differential equations, dynamical systems (ordinary differential equations), real analysis, complex analysis, numerical analysis and continuum mechanics. In the selection procedure the candidate's complete undergraduate academic record will be considered.

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 137

Fundamental modules

Project 795 (WTW 795) - Credits: 30.00

Core modules

Mathematics and mathematical literacy education 730 (MCE 730) - Credits: 16.00
Educational research methodology 745 (NMQ 745) - Credits: 16.00
Functional analysis 710 (WTW 710) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00

Elective modules

Special topics 727 (WTW 727) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00
Main principles of analysis in application 735 (WTW 735) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Continuum mechanics 787 (WTW 787) - Credits: 15.00

BScHons Mathematics and Mathematics Education Differential Equations and Modelling (02240185)

Minimum duration of study	1 year

Programme information

The programme consists of seven honours modules (five modules of 15 credits each from the Department of Mathematics and Applied Mathematics and two modules of 16 credits each from the Department of Science, Mathematics and Technology Education) as well as the compulsory research project (30 credits). Elective modules should be selected according to the prerequisites of these modules.
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and other requirements for honours degrees.

Admission requirements

A BSc in Mathematics, Applied Mathematics or equivalent degree with at least a 60% average in the final year Mathematics or Applied Mathematics subjects. The final year should include at least four of the following third-year level modules or equivalent: partial differential equations, dynamical systems (ordinary differential equations), real analysis, complex analysis, numerical analysis and continuum mechanics. In the selection procedure the candidate's complete undergraduate academic record will be considered.

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 137

Fundamental modules

Project 795 (WTW 795) - Credits: 30.00

Core modules

Mathematics and mathematical literacy education 730 (MCE 730) - Credits: 16.00
Educational research methodology 745 (NMQ 745) - Credits: 16.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Main principles of analysis in application 735 (WTW 735) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00

Elective modules

Special topics 727 (WTW 727) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Continuum mechanics 787 (WTW 787) - Credits: 15.00

BScHons Mathematics of Finance (02240276)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An appropriate BSc or equivalent Bachelor's degree with a minimum of 60% for all Mathematics/Applied mathematics modules at third-year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. In particular, it is required that the candidate has completed real analysis at third-year level and linear algebra on second-year level each with a mark of at least 60% (UP modules WTW 310 and WTW 211 / WTW 221).

Promotion to next study year

The progress of all honours candidates is monitored biannually by the postgraduate coordinator/head of department. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 120

Elective credits: 15

Other programme-specific information:

WTW 732 and WTW 762 are presented as weekly lectures together with some extra block lectures.

Core modules

Functional analysis 710 (WTW 710) - Credits: 15.00
Mathematical models of financial engineering 732 (WTW 732) - Credits: 15.00
Numerical analysis 733 (WTW 733) - Credits: 15.00
Measure theory and probability 734 (WTW 734) - Credits: 15.00
Mathematical models of financial engineering 762 (WTW 762) - Credits: 15.00
Stochastic calculus 764 (WTW 764) - Credits: 15.00
Project 792 (WTW 792) - Credits: 30.00
Project 795 (WTW 795) - Credits: 30.00

Elective modules

Linear models 710 (LMO 710) - Credits: 15.00
Linear models 720 (LMO 720) - Credits: 15.00
Multivariate analysis 710 (MVA 710) - Credits: 15.00
Multivariate analysis 720 (MVA 720) - Credits: 15.00
Mathematical optimisation 750 (WTW 750) - Credits: 15.00
Finite element method 763 (WTW 763) - Credits: 15.00
Mathematical methods and models 772 (WTW 772) - Credits: 15.00
Partial differential equations of mathematical physics 776 (WTW 776) - Credits: 15.00

BScHons Medicinal Plant Science (02240706)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

BSc in Plant Science or a recommendation from the head of department if the candidate did not major in Plant science. A minimum of 60% in Phytomedicine 365 (BOT 365), which is offered at third-year level in the Department of Plant and Soil Science.

The recommended modules at BSc third-year level are as follows:

1. BOT 366 Plant diversity (Department of Plant and Soil Science)
2. BOT 356 Plant ecophysiology (Department of Plant and Soil Science)
3. BCM 368 Molecular basis for disease (Department of Biochemistry)
4. BCM 357 Biocatalysis and integration of metabolism (Department of Biochemistry)
5. FAR 382 Pharmacology (Department of Pharmacology)
6. CMY 282 Physical chemistry (Department of Chemistry)
7. CMY 284 Organic chemistry (Department of Chemistry)

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 105

Elective credits: 30

Other programme-specific information:

Students may register for modules to the maximum of 20 credits presented by another department, which forms part of the elective modules.

Apart from the compulsory and elective modules, a project, leading to a research report (60 credits), forms an essential part of the programme. One seminar (15 credits) must also be written and presented. Field excursions are undertaken. In addition to the compulsory modules, electives are selected in consultation with the supervisor.

Core modules
Phytopharmacology 748 (BOT 748) - Credits: 10.00
Pharmacognosy/Phytotherapy 749 (BOT 749) - Credits: 10.00
Advanced phytomedicine 761 (BOT 761) - Credits: 10.00
Research report 782 (BOT 782) - Credits: 60.00
Seminar 783 (BOT 783) - Credits: 15.00

Elective modules
Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Plant nomenclature 712 (BOT 712) - Credits: 10.00
Seed ecology 714 (BOT 714) - Credits: 10.00
Plant morphology 717 (BOT 717) - Credits: 10.00
Introduction to plant biotechnology 718 (BOT 718) - Credits: 10.00
Primary plant metabolism 719 (BOT 719) - Credits: 10.00
Plant taxonomy 741 (BOT 741) - Credits: 10.00
Plant classification and phytogeography 742 (BOT 742) - Credits: 20.00
Applications in plant biotechnology 746 (BOT 746) - Credits: 10.00
Trends in plant science 784 (BOT 784) - Credits: 10.00
Practical plant identification 786 (BOT 786) - Credits: 10.00
Spatial analysis in ecology 788 (BOT 788) - Credits: 10.00

BScHons Meteorology (02240074)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate bachelor's degree is a prerequisite: a candidate with an average of less than 60% in the major subjects in the final year of the bachelor's degree will only be admitted with the approval of the Dean on the recommendation of the head of department. Additional conditions may be prescribed by the head of department.

A BSc in Meteorology degree

OR

An appropriate bachelor's degree with second-year mathematics and first-year physics.

WKD 155 Atmospheric structure and processes
WKD 164 Climate and weather of Southern Africa
WKD 261 Physical meteorology
GMA 220 Remote sensing
WKD 263 Introduction to dynamical meteorology
WKD 352 Atmospheric vorticity and divergence
WKD 361 Quasi-geostrophic analysis
WKD 366 Fundamentals of weather forecasting
WTW 114 Calculus*
WTW 128 Calculus* AND WTW 126 Linear algebra* OR WTW 124
WTW 218 Calculus*
WTW 248 Vector Analysis *
PHY 171 First course in physics* or PHY 114 and PHY 124
(*or an equivalent qualification as approved by the head of the department.)

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 99

Elective credits: 36

Other programme-specific information:

Appropriate honours modules from the other disciplines in the Department or Faculty may be taken on approval by the Honours coordinator or Head of Department.

Core modules

Numerical modelling: applications 704 (WKD 704) - Credits: 12.00
Dynamic meteorology 706 (WKD 706) - Credits: 16.00
Radar meteorology 707 (WKD 707) - Credits: 12.00
Overview of tropical and mid-latitude meteorology 731 (WKD 731) - Credits: 12.00
Satellite meteorology 733 (WKD 733) - Credits: 12.00
Research project 763 (WKD 763) - Credits: 35.00

Elective modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Natural woodland and forests: Ecology and management 700 (BOT 700) - Credits: 15.00
Basis in environmental health 772 (EHM 772) - Credits: 5.00
Introduction to environmental and occupational health 775 (EOH 775) - Credits: 10.00
Advanced remote sensing 705 (GMA 705) - Credits: 15.00
Environmental management and risk assessment 716 (GTX 716) - Credits: 15.00
Responsible ecotourism management 714 (TBE 714) - Credits: 20.00
Seasonal and climate modelling 703 (WKD 703) - Credits: 12.00
Boundary layer meteorology 719 (WKD 719) - Credits: 12.00
Mesoscale meteorology 734 (WKD 734) - Credits: 12.00
Selected themes 736 (WKD 736) - Credits: 12.00
Cloud dynamics 781 (WKD 781) - Credits: 12.00

BScHons Microbiology (02240601)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

An average pass mark of 60% or more in at least four modules presented by the Department of Microbiology and Plant Pathology at 300-level (one of which must be MBY 364) or permission by the head of department. Note that additional modules may be prescribed by the head of the department where deemed necessary.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core modules

Research methods 751 (MCP 751) - Credits: 30.00
Seminar course 752 (MCP 752) - Credits: 15.00
Trends in microbiology 753 (MCP 753) - Credits: 15.00
Research project and literature study 754 (MCP 754) - Credits: 60.00
Molecular and cellular biology 721 (MLB 721) - Credits: 15.00

BScHons Physics (02240232)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

BSc (or equivalent qualification) with a minimum of 60% in physics at third-year level OR with permission from the head of department.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Other programme-specific information:

Students registered for the BScHons in Physics degree enrol for Physics 700. The programme comprises of 135 credits and consists of 220 lectures.It includes a research project of 35 credits comprising an individual research report that culminates in a seminar presentation. The programme may optionally include advanced experimental work. The curriculum is compiled in consultation with the Head of the Department of Physics, from whom details are available. With permission from the head of department a maximum of 30 credits may be taken from other postgraduate modules from other departments.

The modules listed below may be taken by students in other honours degree programmes. They must, however, first consult with the Head of the Department of Physics about the availability of a particular module in a particular year.

Core modules
Physics 700 (FSK 700) - Credits: 135.00

BScHons Plant Science (02240707)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

BSc in Plant Science, or a recommendation from the head of the department if the candidate did not major in Plant Science. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the participating departments.

Other programme-specific information

BOT 705 and BTW 701 are for BScHons (Biotechnology) students. PB students who wish to take one of these modules as an elective need to apply to the programme leader.

The curriculum for the balance of the credits will be determined by the heads of department of the interdepartmental BScHons (Biotechnology) degree programme.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Core credits: 85
Elective credits: 50

The programme consists of compulsory modules and elective modules. Students may register for modules to the maximum of 20 credits presented by another department, which forms part of the elective modules.
The following fields are presented in the BScHons in Plant Science programme:

- Plant Diversity (D)
- Plant Biotechnology/Physiology (PB)
- Plant Ecology (E)
- Option: Medicinal Plant Science

Apart from the compulsory and elective modules, a project, leading to a research report (60 credits), forms an essential part of the training programme. One seminar (15 credits) must also be written and presented. Field excursions are undertaken.
In addition to the compulsory modules, electives are selected in consultation with the supervisor.
Suitably qualified candidates may also apply for the interdepartmental BScHons in Biotechnology degree (Code 02240393) with a supervisor in the Department of Plant and Soil Science.
Please consult Prof P Bloomer, Tel: +27 12 420 3259, for further details.

Core modules

Research report 782 (BOT 782) - Credits: 60.00
Seminar 783 (BOT 783) - Credits: 15.00
Land reclamation and restoration ecology 791 (BOT 791) - Credits: 15.00

Elective modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Natural woodland and forests: Ecology and management 700 (BOT 700) - Credits: 15.00
Molecular techniques 705 (BOT 705) - Credits: 15.00
Plant nomenclature 712 (BOT 712) - Credits: 10.00
Seed ecology 714 (BOT 714) - Credits: 10.00
Plant morphology 717 (BOT 717) - Credits: 10.00
Introduction to plant biotechnology 718 (BOT 718) - Credits: 10.00
Primary plant metabolism 719 (BOT 719) - Credits: 10.00
Plant ecology 730 (BOT 730) - Credits: 10.00
Plant taxonomy 741 (BOT 741) - Credits: 10.00
Plant classification and phytogeography 742 (BOT 742) - Credits: 20.00
Applications in plant biotechnology 746 (BOT 746) - Credits: 10.00
Advanced phytomedicine 761 (BOT 761) - Credits: 10.00
Trends in plant science 784 (BOT 784) - Credits: 10.00
Practical plant identification 786 (BOT 786) - Credits: 10.00

Spatial analysis in ecology 788 (BOT 788) - Credits: 10.00
Biotechnology in the workplace 701 (BTW 701) - Credits: 15.00

BScHons Soil Science Environmental Soil Science (02240600)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits: 135

Other programme-specific information:

The honours degree is awarded on the basis of formal modules passed. Students registered for the BScHons in Soil Science [Option: Environmental Soil Science] will register for all the soil science modules prescribed at honours level, as well as any other modules deemed necessary by the head of department.

Core modules

Crop production systems (I): Field crops 785 (AGR 785) - Credits: 15.00
Advanced environmental soil chemistry 771 (GDK 771) - Credits: 15.00
Advanced environmental soil physics 772 (GDK 772) - Credits: 15.00
Plant nutrition, soil biology and soil fertility 773 (GDK 773) - Credits: 15.00
Research project in environmental soil science 775 (GDK 775) - Credits: 30.00
Environmental biophysics 750 (LKM 750) - Credits: 15.00
Scientific communication 702 (PGW 702) - Credits: 15.00
Research methodology 704 (PGW 704) - Credits: 15.00

BScHons Wildlife Management (02240700)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

All applications for admission should be submitted electronically by 30 October of the preceding year.

To qualify for admission to the BScHons in Wildlife Management, prospective students must have completed a BSc degree with Animal Science, Ecology, Zoology, Plant Science, or a similar relevant biological major subject; or a BScAgric Animal Sciences and/or Plant Production; a BSc Forestry, a BVSc degree, or a similar degree. A South African equivalent aggregate mark of 60% is usually required for all the modules taken in the final year of undergraduate studies. Determination, attitude and standard of undergraduate projects, where available, will also be taken into consideration. Students are selected on merit.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Year 1

Minimum credits: 135

Core modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Practical plant identification 786 (BOT 786) - Credits: 10.00
Wildlife ecology 780 (NLB 780) - Credits: 10.00
Wildlife management principles and techniques 781 (NLB 781) - Credits: 10.00
Wildlife nutrition 782 (NLB 782) - Credits: 15.00
Parasites, diseases and the capture of wildlife animals 783 (NLB 783) - Credits: 10.00
Scientific communication 785 (NLB 785) - Credits: 5.00
Research project 795 (NLB 795) - Credits: 50.00
Range management in wildlife systems 701 (WDE 701) - Credits: 10.00

Curriculum: Final year

Minimum credits: 135

Core modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00

Practical plant identification 786 (BOT 786) - Credits: 10.00
Wildlife ecology 780 (NLB 780) - Credits: 10.00
Wildlife management principles and techniques 781 (NLB 781) - Credits: 10.00
Wildlife nutrition 782 (NLB 782) - Credits: 15.00
Parasites, diseases and the capture of wildlife animals 783 (NLB 783) - Credits: 10.00
Scientific communication 785 (NLB 785) - Credits: 5.00
Research project 795 (NLB 795) - Credits: 50.00
Range management in wildlife systems 701 (WDE 701) - Credits: 10.00

BScHons Zoology (02240703)

Minimum duration of study	1 year

Programme information

Renewal of registration

i. Subject to exceptions approved by the Dean, on the recommendation of the relevant head of department, and in the case of distance education where the Dean formulates the stipulations that will apply, a student may not sit for an examination for the honours degree more than twice in the same module.
ii. A student for an honours degree must complete his or her study, in the case of full-time students, within two years and, in the case of after-hours students, within three years of first registering for the degree and, in the case of distance education students, within the period stipulated by the Dean. Under special circumstances, the Dean, on the recommendation of the relevant head of department, may give approval for a limited extension of this period.

In calculating marks, General Regulation G.12.2 applies.

Apart from the prescribed coursework, a research project is an integral part of the study.

Admission requirements

In addition to the requirements of General Regulations G.1.3 and G.62, an appropriate bachelor's degree is a prerequisite: a candidate with an average of less than 65% in the major subjects in the final year of the bachelor’s degree will only be admitted with the approval of the Dean on the recommendation of the Head of Department. Additional conditions may be prescribed by the Head of Department.

Examinations and pass requirements

A pass mark is required for all the components of the honours study programme.

Pass with distinction

The BScHons degree is awarded with distinction to a candidate who obtains a weighted average of at least 75% in all the prescribed modules and a minimum of 65% in any one module.

Curriculum: Final year

Minimum credits: 135

Minimum credits:	135
Core credits:	81
Elective credits:	54

Core modules

Statistics for biological sciences 780 (BME 780) - Credits: 15.00
Research project 701 (ZEN 701) - Credits: 68.00
Research methods and scientific communication 713 (ZEN 713) - Credits: 13.00

Elective modules

Systematics, evolution and biogeography 703 (ZEN 703) - Credits: 13.00
Environmental physiology 704 (ZEN 704) - Credits: 13.00
Principles in applied ecology 705 (ZEN 705) - Credits: 13.00
Integrated pest management in Africa 707 (ZEN 707) - Credits: 13.00
Mammal ecology 710 (ZEN 710) - Credits: 13.00
Behavioural ecology 712 (ZEN 712) - Credits: 13.00
Insect-plant interactions 782 (ZEN 782) - Credits: 13.00
Global climate change and biodiversity 783 (ZEN 783) - Credits: 13.00
Contemporary research techniques 784 (ZEN 784) - Credits: 13.00

Master's

MAgric Animal Production Management (02256000)

Minimum duration of study	1 year

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

The minimum admission requirements are a BAgricHons or BScAgric degree in Animal Production or equivalent qualification with a minimum weighted average of 60% in the final year of study.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Pass with distinction

The MScAgric degree is conferred with distinction on candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for

the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Animal Production Management 802 (APZ 802) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Animal Production Management 802 (APZ 802) - Credits: 180.00

MAgric Extension and Rural Development (02256001)

Minimum duration of study	1 year

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- BAgricHons (Extension) – with an average of 60%;

or a Postgraduate Diploma in Extension and Rural Development with an average of 60% in each module and the completion of at least 60 credits at honours level;

or BInstAgrarHons (Extension) with an average of 60% plus. At least 120 credits of relevant extension modules at postgraduate level (honours level) with an average of 60% plus in each module.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Pass with distinction

The MScAgric degree is conferred with distinction on candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Agrarian Extension 890 (AGV 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Agrarian Extension 890 (AGV 890) - Credits: 180.00

MAgric Rural Development (02256003)

Minimum duration of study	2 years

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the

second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

Admission to the master's degree is dependent upon the candidate being in possession of the BInstAgrarHons/BAgricHons degree of the University of Pretoria or another appropriate degree equivalent to or higher than the status thereof as evaluated by the Director of the School and the head(s) of the particular department(s).

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Pass with distinction

The MScAgric degree is conferred with distinction on candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 75

Programme information:

Minimum credits: 180

Core credits: 105

Elective credits: 75

Please note: LEK 885 (15 credits) to be taken in the second semester.

Core modules
Food policy 833 (LEK 833) - Credits: 15.00
Measuring and monitoring food security 834 (LEK 834) - Credits: 15.00
Institutional economics 882 (LEK 882) - Credits: 15.00
Advanced rural finance 884 (LEK 884) - Credits: 15.00

Curriculum: Final year
Minimum credits: 105

Core modules
Mini-dissertation: Rural development 891 (ARD 891) - Credits: 105.00

MConSci (02253014)

Minimum duration of study	2 years

Admission requirements

For the MConsumer Science degree in Clothing, Interior Foods and Nutrition, a four-year BConsumer Science degree that is BCom-based is required. A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for admission.

For the MConsumer Science General other applicable four-year degrees will be considered.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

A basic course in statistics is compulsory when a quantitative approach is used for the research for the dissertation.

Work on the dissertation consists of three parts, namely a research proposal, project execution, and writing the dissertation. It is compulsory to give an oral presentation of the proposal as well as of the research on completion of the degree.

Pass with distinction

The degree is conferred with distinction on a student who obtains a final average of at least 75%, as well as at least 75% for the dissertation and provided that all the members of the Examination Commission indicate in writing that the degree be conferred with distinction.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

MConSci Clothing Management (02253012)

Minimum duration of study	2 years

Admission requirements

- A four-year BConsumer Science degree that is BCom-based is required. A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for admission.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

A basic course in statistics is compulsory when a quantitative approach is used for the research for the dissertation.

Work on the dissertation consists of three parts, namely a research proposal, project execution, and writing the dissertation. It is compulsory to give an oral presentation of the proposal as well as of the research on completion of the degree.

Pass with distinction

The degree is conferred with distinction on a student who obtains a final average of at least 75%, as well as at least 75% for the dissertation and provided that all the members of the Examination Commission indicate in writing that the degree be conferred with distinction.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

MConSci Food Management (02253013)

Minimum duration of study	2 years

Admission requirements

- A four-year BConsumer Science degree that is BCom-based is required.
- A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for admission.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

A basic course in statistics is compulsory when a quantitative approach is used for the research for the dissertation.

Work on the dissertation consists of three parts, namely a research proposal, project execution, and writing the dissertation. It is compulsory to give an oral presentation of the proposal as well as of the research on completion of the degree.

Pass with distinction

The degree is conferred with distinction on a student who obtains a final average of at least 75%, as well as at least 75% for the dissertation and provided that all the members of the Examination Commission indicate in writing that the degree be conferred with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

MConSci Interior Merchandise Management (02253011)

Minimum duration of study	2 years

Admission requirements

- A four-year BConsumer Science degree that is BCom-based is required.
- A minimum average of 60% in the broad area of specialisation that the student wishes to pursue is required for admission.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

A basic course in statistics is compulsory when a quantitative approach is used for the research for the dissertation.

Work on the dissertation consists of three parts, namely a research proposal, project execution, and writing the dissertation. It is compulsory to give an oral presentation of the proposal as well as of the research on completion of the degree.

Pass with distinction

The degree is conferred with distinction on a student who obtains a final average of at least 75%, as well as at least 75% for the dissertation and provided that all the members of the Examination Commission indicate in writing that the degree be conferred with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Consumer science 890 (VBR 890) - Credits: 180.00

MSc Actuarial Science (02250396)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- A BScHons degree in Actuarial Science with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Admission is also subject to the availability of a suitable supervisor for the study.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Actuarial science 890 (AKW 890) - Credits: 180.00

MSc Advanced Data Analytics (Coursework) (02250194)

Minimum duration of study	2 years

Programme information

Details of compilation of curriculum are available from the Head of the Department of Statistics as well as from the departmental postgraduate brochure.

A candidate must compile his/her curriculum in consultation with the head of department or his representative. Refer to the Departmental website for further information.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Other programme-specific information

As long as progress is satisfactory, renewal of registration of a master's student will be accepted for a second year of study in the case of a full-time student. Renewal of registration for a third and subsequent years for a full-time student will only take place when Student Administration of the Faculty receives a written motivation (the required form can be obtained from the relevant head of department) that is supported by the head of department and Postgraduate Studies Committee. (Also see the General Regulations.)

Details of compilation of curriculum are available from the Head of the Department of Statistics as well as from the departmental postgraduate brochure.

A candidate must compile his/her curriculum in consultation with the head of department or his representative. Refer to the Departmental website for further information.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 80

All master's students in Statistics/Mathematical Statistics should enrol for STK 899 which is a compulsory but non-credit-bearing module. The satisfactory completion of this module is a prerequisite for embarking on the research component of the degree programme.

Students should choose any four (4) of the elective modules in the list, to the maximum of 80 credits.

Fundamental modules

Research orientation 899 (STK 899) - Credits: 0.00

Elective modules

Statistical and machine learning 880 (MVA 880) - Credits: 20.00
Capita selecta: Statistics 880 (STK 880) - Credits: 20.00
Analysis of time series 880 (TRA 880) - Credits: 20.00
Data science: analytics and visualisation 880 (TRG 880) - Credits: 20.00
Cyber analytics 802 (WST 802) - Credits: 20.00

Curriculum: Final year

Minimum credits: 100

Fundamental modules
Research orientation 899 (STK 899) - Credits: 0.00

Core modules
Mini-dissertation: Mathematical statistics 895 (WST 895) - Credits: 100.00

MSc Air Quality Management (02250520)

Minimum duration of study	1 year

Programme information

Coordinated by the Department of Geography, Geoinformatics and Meteorology.

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The extensions to the National Environmental Management Act (NEMA) promulgated after 2005 affect environmental management in South Africa in a profound way. In particular, the Air Quality Act brings South African legislation into line with international trends. The metro councils are charged with the responsibility of implementing the Act at the local level. In addition, companies need appropriate expertise to obtain licenses for their air quality management plans. This focus area serves to provide suitable expertise for the implementation of the above legislation by industry by training graduates specialised for careers in air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning the legislative requirements with respect to air quality management, modelling of and measurement of air pollution and the interpretation of pollution plumes, the measurement and interpretation of chemical air pollution as well as dust pollution, international agreements and requirements as well as the effects of air pollution on humans.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an appropriate BScHons degree (or equivalent degree with the status thereof) as evaluated by the Director of the Centre and the head(s) of the particular department(s). In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. Admission is also subject to the availability of a suitable supervisor for the study. The study will involve a research dissertation under supervision of an academic staff member(s) of the University of Pretoria, during which the candidate should prove that he/she is able to write a research article for a peer-

reviewed scientific journal. Additional modules in related topics may be prescribed for students, depending on their academic background.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Air quality management 898 (ENV 898) - Credits: 180.00

MSc Air Quality Management (Coursework) (02250408)

Minimum duration of study	2 years

Programme information

Coordinated by the Department of Geography, Geoinformatics and Meteorology.

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The extensions to the National Environmental Management Act (NEMA) promulgated after 2005 affect environmental management in South Africa in a profound way. In particular, the Air Quality Act brings South African legislation into line with international trends. The metro councils are charged with the responsibility of implementing the Act at the local level. In addition, companies need appropriate expertise to obtain licenses for their air quality management plans. This focus area serves to provide suitable expertise for the implementation of the above legislation by industry by training graduates specialised for careers in air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning the legislative requirements with respect to air quality management, modelling of and measurement

of air pollution and the interpretation of pollution plumes, the measurement and interpretation of chemical air pollution as well as dust pollution, international agreements and requirements as well as the effects of air pollution on humans.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Boundary layer meteorology 811 (AQM 811) - Credits: 15.00
Atmospheric chemistry 812 (AQM 812) - Credits: 15.00
Atmospheric thermodynamics 813 (AQM 813) - Credits: 15.00
Air pollution: society and environment 814 (AQM 814) - Credits: 15.00
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00

Mini-dissertation 891 (ENV 891) - Credits: 90.00

Curriculum: Final year
Minimum credits: 180

Core modules
Boundary layer meteorology 811 (AQM 811) - Credits: 15.00
Atmospheric chemistry 812 (AQM 812) - Credits: 15.00
Atmospheric thermodynamics 813 (AQM 813) - Credits: 15.00
Air pollution: society and environment 814 (AQM 814) - Credits: 15.00
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00

MSc Applied Mathematics (02250172)

Minimum duration of study	1 year

Programme information
The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements
- An appropriate BScHons degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate’s complete undergraduate and honours academic record will be considered. In particular it is strongly recommended that the following modules be included at honours level: Measure and integration theory, Functional analysis, Partial differential equations and Numerical analysis.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year
The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Applied mathematics 890 (TWS 890) - Credits: 180.00

MSc Biochemistry (02250512)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

Candidates must have obtained 60% or more for a BScHons (Biochemistry) or equivalent degree. The level of proficiency of qualifying candidates may further be assessed by an entrance evaluation examination. Admission is also contingent upon the availability of supervisors and/or research projects in the department.

Additional requirements

A recommendation from the head of department and depending on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where

applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Biochemistry: Dissertation 890 (BCM 890) - Credits: 180.00

MSc Bioinformatics (02250514)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Students must be in possession of a BScHons degree in Bioinformatics or the equivalent thereof.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Bioinformatics: Dissertation 803 (BIF 803) - Credits: 180.00

MSc Biotechnology (02250537)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree, with a final grade point average of 60%, is a prerequisite for admission. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor, head of department and/or Postgraduate Studies Committee.
- Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the participating departments.

Additional requirements

Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the participating departments.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Agronomy 890 (AGR 890) - Credits: 180.00
Biochemistry: Dissertation 890 (BCM 890) - Credits: 180.00
Dissertation: Plant science 890 (BOT 890) - Credits: 180.00
Dissertation: Genetics 890 (GTK 890) - Credits: 180.00

MSc Chemistry (02250123)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies

Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Chemistry 890 (CHM 890) - Credits: 180.00

MSc Engineering and Environmental Geology Hydrogeology (02250376)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional

requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Hydrogeology 890 (GTX 890) - Credits: 180.00

MSc Engineering and Environmental Geology (02250375)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for

admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Engineering Geology 890 (IGL 890) - Credits: 180.00

MSc Engineering Geology (02250374)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Engineering Geology 890 (IGL 890) - Credits: 180.00

MSc Entomology (02250518)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of

registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of at least 60% in the honours year of study, or recommendation by the Head of Department, is required for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the Head of Department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects and funding within the Department of Zoology and Entomology.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Entomology 890 (ENT 890) - Credits: 180.00

MSc Environment and Society (02250522)

Minimum duration of study	1 year

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The programme is coordinated by the Department of Geography, Geoinformatics and Meteorology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the humanities. On completion of the training, candidates should be conversant and be able to partake in, or render advice

concerning, all aspects involved in the management of human-environment interactions. This includes social impact assessments, policy formulation, social development and planning, participatory appraisal assessments, demographic pattern and trend interpretations, resource appraisals and management.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an appropriate BScHons degree (or equivalent degree with the status thereof) as evaluated by the Director of the Centre and the head(s) of the particular department(s). In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. Admission is additionally dependent on availability of supervisor/s and/or projects within the department. The study will involve a research dissertation under supervision of an academic staff member(s) of the University of Pretoria, during which the candidate should prove that he/she is able to write a research article for a peer-reviewed scientific journal. Additional courses in related topics may be prescribed for students, depending on their academic background.
- Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Environment and society 893 (ENV 893) - Credits: 180.00

MSc Environment and Society (Coursework) (02250403)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The programme is coordinated by the Department of Geography, Geoinformatics and Meteorology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the humanities. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the management of human-environment interactions. This includes social impact assessments, policy formulation, social development and planning, participatory appraisal assessments, demographic pattern and trend interpretations, resource appraisals and management.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Before application for admission to the MSc (Environment and Society) degree programme candidates must be in possession of a four-year degree qualification BScHons or equivalent degree status which includes appropriate subjects in the humanities geography or planning. Final admission is subject to the approval of the Director of the Centre and the Head of the Department of Geography Geoinformatics and Meteorology.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Other programme-specific information

At least one additional elective module must be selected in consultation with the Director of the Centre and the Head of the Department of Geography, Geoinformatics and Meteorology. Options will be based on the academic background and/or anticipated career of the candidate.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Programme information:

Minimum credits: 180

Core credits: 150

Elective credits: 30

Core modules

Environment and development 811 (ENS 811) - Credits: 15.00
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
Social modelling and assessment 824 (ENS 824) - Credits: 15.00
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Environmental change 881 (OMS 881) - Credits: 15.00

Curriculum: Final year

Minimum credits: 180

Core modules

Environment and development 811 (ENS 811) - Credits: 15.00
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
Social modelling and assessment 824 (ENS 824) - Credits: 15.00
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Environmental change 881 (OMS 881) - Credits: 15.00

MSc Environmental Ecology (02250524)

Minimum duration of study	1 year

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

Coordinated by the Department of Zoology and Entomology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the ecology of the environment, including conservation planning, environmental management and air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the management of the ecological consequences of human existence. This includes a thorough grounding in ecosystem structure, composition and function, ecosystem services, notions of ecosystem health, the management of declining and small populations, captive propagation, control of invasive species, species and community restoration, conservation education, local communities and conservation, as well as aspects of biogeography and macro-ecology, conservation planning and monitoring, the structure, composition and function of biological communities, population and community variability.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Environmental ecology 892 (ENV 892) - Credits: 180.00

MSc Environmental Ecology (Coursework) (02250404)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

Coordinated by the Department of Zoology and Entomology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the ecology of the environment, including conservation planning, environmental management and air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the management of the ecological consequences of human existence. This includes a thorough grounding in ecosystem structure, composition and function, ecosystem services, notions of ecosystem health, the management of declining and small populations, captive propagation, control of invasive species, species and community restoration, conservation education, local communities and conservation, as well as aspects of biogeography and macro-ecology, conservation planning and monitoring, the structure, composition and function of biological communities, population and community variability.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Before application for admission to the MSc (Environmental Ecology) degree programme candidates must be in possession of a four-year degree qualification BScHons or equivalent degree status (SAQA NQF 8) which includes appropriate subjects in ecology. Admission is subject to the approval of the Director of the Centre and the appropriate head of department outside the Centre.
- Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

One of the listed specialisation modules may be substituted with an elective module subject to the approval of the Director of the Centre. Choice of an elective is based on the academic background and/or anticipated career of the student but is expected to be relevant to either conservation biology or sustainable forestry management.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Programme information:

Minimum credit: 180

Core credits: 120

Elective credits: 60

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Trees in a multifunctional landscape 833 (ENV 833) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Conservation planning and monitoring 808 (ZEN 808) - Credits: 15.00
Biogeography and macro-ecology 809 (ZEN 809) - Credits: 15.00

Elective modules

Environment and development 811 (ENS 811) - Credits: 15.00
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
Social modelling and assessment 824 (ENS 824) - Credits: 15.00
International environmental management systems 822 (ENV 822) - Credits: 15.00
Water quality management 810 (EWM 810) - Credits: 15.00
Water conservation and demand management 821 (EWM 821) - Credits: 15.00
Water supply and sanitation 822 (EWM 822) - Credits: 15.00
Forest ecology and management 835 (FOR 835) - Credits: 15.00

Curriculum: Final year

Minimum credits: 180

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Trees in a multifunctional landscape 833 (ENV 833) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Conservation planning and monitoring 808 (ZEN 808) - Credits: 15.00
Biogeography and macro-ecology 809 (ZEN 809) - Credits: 15.00

Elective modules

Environment and development 811 (ENS 811) - Credits: 15.00
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
Social modelling and assessment 824 (ENS 824) - Credits: 15.00
International environmental management systems 822 (ENV 822) - Credits: 15.00
Water quality management 810 (EWM 810) - Credits: 15.00
Water conservation and demand management 821 (EWM 821) - Credits: 15.00
Water supply and sanitation 822 (EWM 822) - Credits: 15.00
Forest ecology and management 835 (FOR 835) - Credits: 15.00

MSc Environmental Economics (Coursework) (02250405)

Minimum duration of study	1 year

Programme information

This programme is coordinated in the Department of Agricultural Economics, Extension and Rural Development.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- For admission to the MSc in Environmental Economics, candidates must have a four-year degree qualification (BScHons, BScAgric or BScAgric in Agricultural Economics) or equivalent degree status with appropriate subjects in economics and statistics. Final admission is subject to the approval of the Director of the Centre of Environmental Economics and Policy (CEEPA) and/or the Head of the Department of Agricultural Economics

Extension and Rural Development.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Applied econometrics 810 (LEK 810) - Credits: 15.00
Applied micro-economics 815 (LEK 815) - Credits: 15.00
Environmental valuation and policy 826 (LEK 826) - Credits: 15.00
Natural resource and environmental economics 880 (LEK 880) - Credits: 15.00
Mini-dissertation: Agricultural economics 892 (LEK 892) - Credits: 90.00

Elective modules

Production economics 811 (LEK 811) - Credits: 15.00
Quantitative methods for agricultural and environmental policy 814 (LEK 814) - Credits: 15.00
Institutional economics 882 (LEK 882) - Credits: 15.00
The economics of natural resources 886 (LEK 886) - Credits: 15.00

MSc Environmental Education (02250528)

Minimum duration of study	1 year

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

This programme is coordinated by the Faculty of Education.

The purpose of this focus area is to train environmental graduates who specialised in careers in environmental education. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the transfer of environmental principles by education. This includes the transfer of relevant ethical, social and ecological principles to learners, the roles of the NQF and outcomes-based

education for approaches towards environmental education, the roles of facilitation, engagement, meta-learning, creative problem solving, cooperative learning and feedback in the learning task.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- BScHons degree or equivalent degree
- In the selection procedure the candidate's complete undergraduate and honours academic record will be considered.
- Additional courses in related topics may be prescribed for students, depending on their academic background

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Environmental education 897 (ENV 897) - Credits: 180.00

MSc Environmental Education (Coursework) (02250531)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

This programme is coordinated by the Faculty of Education.

The purpose of this focus area is to train environmental graduates who specialised in careers in environmental education. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the transfer of environmental principles by education. This includes the transfer of relevant ethical, social and ecological principles to learners, the roles of the NQF and outcomes-based education for approaches towards environmental education, the roles of facilitation, engagement, meta-learning, creative problem solving, cooperative learning and feedback in the learning task.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Other programme-specific information

At least one additional elective module must be selected in consultation with the Director of the Centre and the Head of the Department of Curriculum Studies, Faculty of Education. Choices will be based on the academic background and/or anticipated career of the candidate.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation,

that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Research methods in science education 881 (SCE 881) - Credits: 15.00

Curriculum: Final year

Minimum credits: 180

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Research methods in science education 881 (SCE 881) - Credits: 15.00

MSc Environmental Management (02250526)

Minimum duration of study	1 year

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

Coordinated by the Department of Zoology and Entomology.

The purpose of this focus area is to train environmental graduates considered generalists for managing the full spectrum of human-environment-economic interactions. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in managing social, economic and environmental processes in a sustainable manner. This includes social and environmental impact assessment, policy formulation, social development and planning, eco-system structure, composition and function, ecosystem services, ecosystem health, invasive species, species and community restoration, conservation education, local communities and conservation, economic inefficiency, misallocation, market failure, policy failure, the economics of renewable and non-renewable resources, cost-benefit analysis, valuation of environmental goods and services and environmental accounting.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an appropriate BScHons degree (or equivalent degree with the status thereof) as evaluated by the Director of the Centre and the head(s) of the particular department(s). In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. Admission is additionally dependent on availability of supervisor/s and/or projects within the department. The study will involve a research dissertation under supervision of an academic staff member(s) of the University of Pretoria, during which the candidate should prove that he/she is able to write a research article for a peer-reviewed scientific journal. Additional courses in economics or related topics may be prescribed for students, depending on their academic background.
- Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Environmental management 894 (ENV 894) - Credits: 180.00

MSc Environmental Management (Coursework) (02250407)

Minimum duration of study	2 years

Programme information

Coordinated by the Department of Zoology and Entomology.

The purpose of this focus area is to train environmental graduates considered generalists for managing the full spectrum of human-environment-economic interactions. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in managing social,

economic and environmental processes in a sustainable manner. This includes social and environmental impact assessment, policy formulation, social development and planning, eco-system structure, composition and function, ecosystem services, ecosystem health, invasive species, species and community restoration, conservation education, local communities and conservation, economic inefficiency, misallocation, market failure, policy failure, the economics of renewable and non-renewable resources, cost-benefit analysis, valuation of environmental goods and services and environmental accounting.

There are two independent foci of the master's option in Environmental Management:

- Focus area: Sustainable Development
- Focus area: Environmental Economics

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

Candidates must be in possession of a BScHons degree or a degree with equivalent degree status (SAQA NQF 8). Final admission is subject to the approval of the Director of the Centre for Environmental Studies.

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Other programme-specific information

Note:
For the focus on Sustainable Development, final admission is subject to the approval of the Director of the Centre for Environmental Studies.

For the focus on Environmental Economics, students without a formal background in economics will be considered. Admission is subject to the approval of the Head of the Department of Agricultural Economics, Extension and Rural Development and the Director of the Centre for Environmental Studies. Additional courses in economics or related topics may be prescribed for students, depending on their academic background.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Programme information:

Minimum credits: 180

Core credits: 150

Elective credits: 30

Core modules

Environment and development 811 (ENS 811) - Credits: 15.00
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00

Elective modules

Social modelling and assessment 824 (ENS 824) - Credits: 15.00
Environmental valuation and policy 826 (LEK 826) - Credits: 15.00
Institutional economics 882 (LEK 882) - Credits: 15.00
Environmental change 881 (OMS 881) - Credits: 15.00

Curriculum: Final year

Minimum credits: 180

Core modules

Mini-dissertation 891 (ENV 891) - Credits: 90.00

MSc eScience (Coursework) (02250193)

Minimum duration of study	2 years

Programme information

The curriculum for the MSc (eScience) coursework degree programme comprises 180 credits of coursework and a research component. One of the key features of the curriculum is a capstone project that runs parallel with coursework modules in the first year of study. During the capstone project, students will go through the entire cycles of solving a real-world data science problem, collecting and processing real-world data, designing methods to solve the problem, and implementing a solution. The capstone project and coursework prepare the student for

the mini-dissertation problem supervised by an expert.

Admission requirements

The admission requirements are:

- an honours degree in either statistics, mathematics, computer science, physics, or related fields; AND demonstrable knowledge of basic principles of probability and statistics, computing, calculus and linear algebra;

  OR

- passing an entrance evaluation designed by the academic advisory committee of the programme within the consortium. An average of 65% at honours level is the minimum for consideration, although admission will be competitive and an honours average of at least 70% is highly recommended.
- Student numbers are limited to a maximum of 30.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the participating departments.
- Historical performance during prior studies will also be considered in selecting students. Specific attention will be given to modules repeated and duration of study.
- The research proposal of applicants should be in line with the research focus of the participating departments.
- Any further additional entrance requirements as specified by the head of department in consultation with the departmental postgraduate selection committee.
- The head of department, in consultation with the departmental postgraduate selection committee and participating departments reserves the right to prescribe additional modules.

Other programme-specific information

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and other requirements for master's degrees.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75%, with a minimum of 65% in each module, and a mark of at least 75% for the mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 90

Choose 4 modules to the value of 60 credits from the list of electives.

Core modules

Research methods and capstone project in data science 801 (NEP 801) - Credits: 15.00
Data privacy and ethics 802 (NEP 802) - Credits: 15.00

Elective modules

Adaptive computation and machine learning 803 (NEP 803) - Credits: 15.00
Data visualisation and exploration 804 (NEP 804) - Credits: 15.00
Large-scale computing systems and scientific computing 805 (NEP 805) - Credits: 15.00
Mathematical foundations of data science 806 (NEP 806) - Credits: 15.00
Special topics in data science 807 (NEP 807) - Credits: 15.00
Statistical foundations of data science 808 (NEP 808) - Credits: 15.00
Large-scale optimisation for data science 809 (NEP 809) - Credits: 15.00

Curriculum: Final year

Minimum credits: 90

Fundamental modules

Mini-dissertation: eScience 800 (NEP 800) - Credits: 90.00

MSc Financial Engineering (02250188)

Minimum duration of study	1 year

Programme information

The candidate must complete a dissertation in one of the fields of Financial Engineering in which research is actively being done in the Department of Mathematics and Applied Mathematics.

The programme consists of 180 credits all allocated to the dissertation. If deemed necessary and depending on the candidate's academic background and the scope of the study, additional requirements will be set. These additional requirements are non-credit bearing and will be assessed. The composition of the additional requirements is to be decided in consultation with the supervisor and Head of Department or nominated representative. The successful completion of any additional requirements is mandatory and forms part of the degree requirements.

Full details of the compilation of the curriculum, research fields and names of possible supervisors are available in the departmental postgraduate brochure at: www.up.ac.za/maths/postgrad

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree in Financial Engineering with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Financial engineering 894 (WTW 894) - Credits: 180.00

MSc Food Science (02250506)

Minimum duration of study	1 year

Programme information

Candidates must write a dissertation on their research project in food science and/or food technology and at least a concept research paper for publication in a peer-reviewed scientific journal.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Food science 890 (FST 890) - Credits: 180.00

MSc Forest Management and the Environment (Coursework) (02250415)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

This programme is coordinated by the Department of Plant and Soil Science.

The purpose of this option is to equip graduates with a biological and/or agricultural background to specialise further to obtain skills in environmental management and in sustainable forest resource use and management. On completion of the training, candidates should be conversant with the multifunctional nature of the forest resource base and be equipped to render advice concerning forest resource use and management with an understanding of the environmental consequences associated with exploitative use of natural resources. This includes grounding in forest resource use and management, including yield regulations in natural and

commercial forest systems, participatory approaches to natural resource management, ecosystem structure, composition and function, ecosystem services, notions of ecosystem health, control of invasive species and community restoration, understanding of local communities, forestry and rural development, participatory planning and monitoring, the forest harvesting schedules and logistics, non-timber forest products, the science of wood and forest wood products utilisation, understanding of the basic economics of natural resources and social development and planning.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Candidates must have either a three-year BSc and a BScHons or a four-year degree qualification in agricultural forestry or biological sciences. Admission is subject to the approval of the Forestry Chair in consultation with the Director of the Centre for Environmental Studies.
- Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Programme information:

Minimum credits: 180
Core credits: 135
Elective credits: 45

Core modules
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
General introduction to forestry 831 (FOR 831) - Credits: 15.00

Elective modules
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
International environmental management systems 822 (ENV 822) - Credits: 15.00
Trees in a multifunctional landscape 833 (ENV 833) - Credits: 15.00
Forest resource use planning and management 832 (FOR 832) - Credits: 15.00
Forest engineering 833 (FOR 833) - Credits: 15.00
Wood science and forest products 834 (FOR 834) - Credits: 15.00
Forest ecology and management 835 (FOR 835) - Credits: 15.00
Silviculture 836 (FOR 836) - Credits: 15.00
Forest resource economics and policy 831 (LEK 831) - Credits: 20.00
Environmental change 881 (OMS 881) - Credits: 15.00

Curriculum: Final year
Minimum credits: 180

Core modules
Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
General introduction to forestry 831 (FOR 831) - Credits: 15.00

Elective modules
Strategic environmental management 822 (ENS 822) - Credits: 15.00
Environment and land reform 823 (ENS 823) - Credits: 15.00
International environmental management systems 822 (ENV 822) - Credits: 15.00
Trees in a multifunctional landscape 833 (ENV 833) - Credits: 15.00
Forest resource use planning and management 832 (FOR 832) - Credits: 15.00
Forest engineering 833 (FOR 833) - Credits: 15.00
Wood science and forest products 834 (FOR 834) - Credits: 15.00
Forest ecology and management 835 (FOR 835) - Credits: 15.00
Silviculture 836 (FOR 836) - Credits: 15.00
Forest resource economics and policy 831 (LEK 831) - Credits: 20.00
Environmental change 881 (OMS 881) - Credits: 15.00

MSc Forest Science (02250532)

Minimum duration of study	1 year

Programme information

This is an interdepartmental programme.

The curriculum is to be determined by the heads of department in the biological sciences. Please consult with Prof P Chirwa, Tel: 012 420 3213, for further details.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- A prior four-year bachelor's qualification in Forestry or Forest Science or an equivalent honours degree in a related field.
- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Additional modules may be prescribed by the head of department where deemed necessary.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing

that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Forest science 890 (FOR 890) - Credits: 180.00

MSc Genetics (02250535)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree, with a final grade point average of at least 60%, or on recommendation by the Head of Department. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination. Admission is furthermore contingent on the availability of supervisors and/or research projects within the Department.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Additional modules may be prescribed by the head of department where deemed necessary.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as

may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Genetics 890 (GTK 890) - Credits: 180.00

MSc Geography (02250413)

Minimum duration of study	1 year

Programme information
The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements
- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Geography 890 (GGF 890) - Credits: 180.00

MSc Geoinformatics (02250414)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree
- A final grade point average of at least 65% for the preceding degree

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable

to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Geoinformatics 890 (GIS 890) - Credits: 180.00

MSc Geology (02250142)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Geology 890 (GLG 890) - Credits: 180.00

MSc Mathematics (02250185)

Minimum duration of study	1 year

Programme information

The candidate must complete a dissertation in one of the fields of Mathematics in which research is actively being done in the Department of Mathematics and Applied Mathematics.

The programme consists of 180 credits all allocated to the dissertation. If deemed necessary and depending on the candidate’s academic background and the scope of the study, additional requirements will be set. These additional requirements are non-credit bearing and will be assessed. The composition of the additional requirements is to be decided in consultation with the supervisor and Head of Department or nominated representative. The successful completion of any additional requirements is mandatory and forms part of the degree requirements.

Full details of the compilation of the curriculum, research fields and names of possible superviors are available in the departmental postgraduate brochure at: http://www.up.ac.za/maths/postgrad

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular it is strongly recommended that the following modules be included at honours level: Measure and integration theory, Functional analysis, Topology and Algebra.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

The minimum duration for this degree is one year. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (Also see the General Regulations.)

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation Mathematics 890 (WIS 890) - Credits: 180.00

MSc Mathematics Education (02250187)

Minimum duration of study	1 year

Programme information

The candidate must complete a dissertation in one of the fields of Mathematics Education in which research is actively being done in the Department of Mathematics and Applied Mathematics.

The programme consists of 180 credits all allocated to the dissertation. If deemed necessary and depending on the candidate's academic background and the scope of the study, additional requirements will be set. These

additional requirements are non-credit bearing and will be assessed. The composition of the additional requirements is to be decided in consultation with the supervisor and Head of Department or nominated representative. The successful completion of any additional requirements is mandatory and forms part of the degree requirements.

Full details of the compilation of the curriculum are available in the departmental postgraduate brochure at: http://www.up.ac.za/maths/postgrad

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular it is strongly recommended that the following modules be included on honours level: Measure and integration theory and Functional analysis.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

The minimum duration for this degree is one year. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (Also see the General Regulations.)

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Mathematics education 893 (WTW 893) - Credits: 180.00

MSc Mathematics of Finance (02250186)

Minimum duration of study	1 year

Programme information

The candidate must complete a dissertation in one of the fields of Mathematics of Finance in which research is actively being done in the Department of Mathematics and Applied Mathematics.

The programme consists of 180 credits all allocated to the dissertation. If deemed necessary and depending on the candidate's academic background and the scope of the study, additional requirements will be set. These additional requirements are non-credit bearing and will be assessed. The composition of the additional requirements is to be decided in consultation with the supervisor and Head of Department or nominated representative. The successful completion of any additional requirements is mandatory and forms part of the degree requirements.

Full details of the compilation of the curriculum, research fields and names of possible supervisors are available in the departmental postgraduate brochure at: www.up.ac.za/maths/postgrad

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree with a minimum of 60% for all modules at honours level. In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. In particular it is required that the following modules be included at honours level: Measure and integration theory, Functional analysis and Financial mathematics/Financial engineering.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

The mimimum duration for this degree is normally one year. Subject to other faculty regulations, a student for a master's degree must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a

limited fixed extension of this period. (Also see the General Regulations.)

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Mathematics of finance 892 (WTW 892) - Credits: 180.00

MSc Medicinal Plant Science (02250539)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- BScHons in Medicinal Plant Science with an average of 60% or a recommendation by the head of department. A minimum of 60% will be necessary in the compulsory modules BOT 761, BOT 748 and BOT 749 which are offered at honours level in the Department of Plant and Soil Science.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Medical plant science 890 (MPS 890) - Credits: 180.00

MSc Meteorology (02250073)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.

- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Meteorology 890 (AWM 890) - Credits: 180.00

MSc Microbiology (02250504)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScHons degree, with a final grade point average of at least 60%, or on recommendation by the Head of Department. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination.
- Admission is furthermore contingent on the availability of supervisors and/or research projects within the Department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Microbiology 890 (MBY 890) - Credits: 180.00

MSc Nutrition (02250416)

Minimum duration of study	1 year

Programme information

The degree is conferred based on a dissertation.

Candidates must write a dissertation on their research project in Nutrition and at least a concept research paper for publication in a peer-reviewed scientific journal.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of

department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.
- International qualifications have to be evaluated by SAQA.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Nutrition 890 (VDG 890) - Credits: 180.00

MSc Physics (02250232)

Minimum duration of study	1 year

Programme information

The programme consists of:

- Dissertation (determined by supervisor and head of department)
- Theoretical modules (maximum of 60 lectures) may be taken and are determined by the supervisor and head of department. These modules are to supplement the subject of the dissertation of the student.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- BScHons in Physics (or equivalent qualification) and with permission from the head of department.
- Permission from the head of department and depending on availability of supervisor/s and/or projects within the department.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Permission from the head of department and depending on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Physics 890 (FSK 890) - Credits: 180.00

MSc Plant Pathology (02250500)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department

and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of 60% is required in the honours year of study for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor head of department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Plant pathology 890 (PPT 890) - Credits: 180.00

MSc Plant Science (02250541)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the

second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- BScHons in Plant Science or BScHons in Medicinal Plant Science with an average of 60% or a recommendation from the head of department.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Plant science 890 (BOT 890) - Credits: 180.00

MSc Science Education (02250445)

Minimum duration of study	1 year

Programme information

This programme is offered by the Centre for Science, Mathematics and Technology Education. Students are registered in a discipline department. The MSc (Science Education) is designed for educators who wish to pursue their postgraduate studies in both a scientific discipline and in science education. Science, in this context, is interpreted in its broadest sense, and includes the physical, biological and earth sciences, as well as mathematics and technology.

At the end of this programme the student will be capable of doing research in both scientific and educational disciplines. Candidates achieve an adequate background to pursue further qualifications in either content

disciplines or the discipline of Science Education.

Related master's degree: MSc in Mathematics Education.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

Refer to General Regulations G.30 to G.44.

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Postgraduate modules may be required by the head of the department concerned. The dissertation will be supervised jointly by the Centre for Science Education and a discipline department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Chemistry 890 (CHM 890) - Credits: 180.00

MSc Soil Science (02250502)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- A three-year basic Soil Science degree with a BScHons (Soil Science) or equivalent qualification with a minimum average of 60% is required for admission.
- In addition, a motivation letter reflecting research interest should accompany the application form. Selection of students will be based on academic performance, the motivation letter, available supervisory capacity and research project funding.

Note:

- Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules
Dissertation: Soil science 890 (GDK 890) - Credits: 180.00

MSc Water Resource Management (02250530)

Minimum duration of study	1 year

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

Coordinated by the Department of Microbiology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the sustainable management of water resources. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in water resource management in Southern Africa. This includes principles of quality management, water conservation, water demand management, water supply and sanitation technologies.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an appropriate BScHons degree (or equivalent degree with the status thereof) as evaluated by the Director of the Centre and the head(s) of the particular department(s). In the selection procedure the candidate's complete undergraduate and honours academic record will be considered. Admission is additionally dependent on availability of supervisor/s and/or projects within the department. The study will involve a research dissertation under supervision of an academic staff member(s) of the University of Pretoria, during which the candidate should prove that he/she is able to write a research article for a peer-reviewed scientific journal. Additional courses in related topics may be prescribed for students, depending on their academic background.
- Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable

to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Water resource management 896 (ENV 896) - Credits: 180.00

MSc Water Resource Management (Coursework) (02250406)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

This programme is coordinated by the Department of Microbiology and Plant Pathology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the sustainable management of water resources. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in water resource management in Southern Africa. This includes principles of quality management, water conservation, water demand management, water supply and sanitation technologies.

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- Before application for admission to the MSc (Water Resource Management) degree programme candidates must be in possession of a four-year degree qualification, BScHons or equivalent degree status which includes appropriate subjects in water management and/or water ecology. Final admission is subject to the approval of the Director of the Centre for Environmental Studies and the Head of the Department of Microbiology and Plant Pathology.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Additional requirements

Candidates must demonstrate proficiency in the English language up to the level required by either the TOEFL test (www.ets.org/toefl) or the IELTS language proficiency test (www.ielts.org).

Other programme-specific information

At least one additional elective module must be selected in consultation with the Director of the Centre and the Head of the Department of Microbiology and Plant Pathology. Choice of electives will be based on the academic background and/or anticipated career of the candidate.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Year 1

Minimum credits: 180

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Water quality management 810 (EWM 810) - Credits: 15.00
Water conservation and demand management 821 (EWM 821) - Credits: 15.00
Water supply and sanitation 822 (EWM 822) - Credits: 15.00

Curriculum: Final year

Minimum credits: 180

Core modules

Environmental paradigms 810 (ENV 810) - Credits: 15.00
Environmental law 816 (ENV 816) - Credits: 15.00
Mini-dissertation 891 (ENV 891) - Credits: 90.00
Water quality management 810 (EWM 810) - Credits: 15.00
Water conservation and demand management 821 (EWM 821) - Credits: 15.00
Water supply and sanitation 822 (EWM 822) - Credits: 15.00

MSc Wildlife Management (02250510)

Minimum duration of study	1 year

Programme information

The degree programme entails a research project with dissertation. Please contact the programme manager at the Centre for Wildlife Management for the available options - Prof Michael Somers, Tel: (012) 420 6091 or michael.somers@up.ac.za

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An applicable BScHons in Wildlife Management or an equivalent qualification with a minimum weighted average of 60%.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation,

that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Wildlife management 890 (NLB 890) - Credits: 180.00

MSc Zoology (02250516)

Minimum duration of study	1 year

Programme information

The MSc degree is conferred on the grounds of a dissertation and such additional postgraduate coursework as may be prescribed.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation that is supported by the relevant head of department and Postgraduate Studies Committee.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the General Regulations G.1.3 G.30 and G.62 an appropriate BScHons degree is a prerequisite for admission. An average of at least 60% in the honours year of study, or recommendation by the Head of Department, is required for admission to the MSc. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the supervisor, Head of Department and Postgraduate Studies Committee. Admission is approved by the Postgraduate Studies Committee in consultation with the Head of Department and the supervisor.
- Where admission to the MSc degree study does not follow on a BScHons degree the minimum period of study for the MSc degree is two years.
- ?Admission is additionally dependent on availability of supervisor/s and/or projects and/or funding within the Department of Zoology and Entomology.

Promotion to next study year

The progress of all master's candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Subject to exceptions approved by the Dean, on recommendation of the relevant head of department, and where applicable, a student may not enter for the master's examination in the same module more than twice.

Pass with distinction

The MSc degree is conferred with distinction to candidates who obtain a final average mark of at least 75% and a mark of at least 75% for the dissertation/mini-dissertation from each of the members of the examination panel. Where a member of the examination panel awards a mark of less than 75% for the dissertation/mini-dissertation, that member of the examination panel must offer, in writing, support for his/her decision, or indicate in writing that he/she supports the examination committee's decision to confer the degree with distinction.

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Zoology 890 (ZOO 890) - Credits: 180.00

MScAgric Agricultural Economics (Coursework) (02255001)

Minimum duration of study	2 years		
Contact	Prof SL Hendriks	sheryl.hendriks@up.ac.za	+27 (0)124203811
	Dr M van der Merwe	melissa.vandermerwe@up.ac.za	+27 (0)124204084

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62, a BScAgric degree with major in agricultural economics and 60% average in the final year.

- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Students should complete a module in research methodology as preparation for the dissertation module.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 90

Core modules

Applied econometrics 810 (LEK 810) - Credits: 15.00
Production economics 811 (LEK 811) - Credits: 15.00
Applied micro-economics 815 (LEK 815) - Credits: 15.00
Institutional economics 882 (LEK 882) - Credits: 15.00

Curriculum: Final year

Minimum credits: 90

Core modules

Mini-dissertation: Agricultural economics 892 (LEK 892) - Credits: 90.00

MScAgric Agricultural Extension (02255014)

Minimum duration of study	2 years

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies

Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

A four-year BScAgric degree in any field of specialisation PLUS completion of the BAgricHons (Extension) or at least 120 credits of relevant Extension modules at postgraduate level (honours level) with an average of 60%.

Note:

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Agrarian Extension 890 (AGV 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Agrarian Extension 890 (AGV 890) - Credits: 180.00

MScAgric Agronomy (02255010)

Minimum duration of study	2 years

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student

Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

A four-year Applied Plant Sciences degree or equivalent qualification with a minimum average of 60% is required for admission.

In addition, a motivation letter reflecting research interest should accompany the application form.

Note:

- Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Additional requirements

In addition to the set admission requirements, a motivation letter reflecting research interest should accompany the application form. Selection of students will be based on academic performance, the motivation letter, available supervisory capacity and research project funding.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Agronomy 890 (AGR 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Agronomy 890 (AGR 890) - Credits: 180.00

MScAgric Animal Science Animal Breeding and Genetics (02255013)

Minimum duration of study	2 years

Programme information

The curriculum consists of the following:
A dissertation of 180 credits; or
A dissertation of 150 credits and advanced study in the major subject/s, augmented by ancillary modules to the maximum of 30 credits that may be prescribed by the Dean on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- The minimum admission requirements are a BScAgric degree with specialisation in Animal Science or an equivalent applicable degree, with a minimum weighted average of 60% for modules in the particular field of specialisation in the fourth year of study.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

MScAgric Animal Science Animal Nutrition (02255008)

Minimum duration of study	2 years

Programme information

The curriculum for the MScAgric degree (Animal Science) (Animal Nutrition) consists of the following:

A dissertation of 180 credits; or
A dissertation of 150 credits and advanced study in the major subject/s, augmented by ancillary modules to the maximum of 30 credits that may be prescribed by the Dean on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted

from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- The minimum admission requirements are a BScAgric degree with specialisation in Animal Science or an equivalent applicable degree, with a minimum weighted average of 60% for modules in the particular field of specialisation in the fourth year of study.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

MScAgric Animal Science Livestock Production and Ecology (02255009)

Minimum duration of study	2 years

Programme information

The curriculum consists of the following:
A dissertation of 180 credits; or
A dissertation of 150 credits and advanced study in the major subject/s, augmented by ancillary modules to the maximum of 30 credits that may be prescribed by the Dean on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- The minimum admission requirements are a BScAgric degree with specialisation in Animal Science or an equivalent applicable degree, with a minimum weighted average of 60% for modules in the particular field of specialisation in the fourth year of study.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

MScAgric Animal Science Production Physiology and Product Quality (02255007)

Minimum duration of study	2 years

Programme information

The curriculum for the MScAgric degree consists of a dissertation of 180 credits

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- The minimum admission requirements are a BScAgric degree with specialisation in Animal Science or an equivalent applicable degree, with a minimum weighted average of 60% for modules in the particular field of specialisation in the fourth year of study.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Animal science 890 (VKU 890) - Credits: 180.00

MScAgric Entomology (02255003)

Minimum duration of study	2 years

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 the BScAgric degree is a prerequisite for admission. An average of 60% is required in the final year of the BScAgric degree for admission. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the head of department and the supervisor. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the

examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Entomology 890 (ENT 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Entomology 890 (ENT 890) - Credits: 180.00

MScAgric Genetics (02255005)

Minimum duration of study	2 years

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- An appropriate BScAgric degree, with a final grade point average of at least 60%, or on recommendation by the Head of Department. Preference will be given to applicants with the highest final grade point averages for their preceding degree and qualifying applicants may be subjected to an entrance evaluation examination.
- Admission is furthermore contingent on the availability of supervisors and/or research projects within the Department.

- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Students registered for the MScAgric programme will be required to complete ancillary modules concurrently with the abovementioned dissertation during their first year of registration. These modules will be selected from the Genetics honours modules (700-level). Candidates in possession of a BScAgricHons may be exempted from these modules.

Note: Additional modules may be prescribed by the head of department where deemed necessary.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Genetics 890 (GTK 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Genetics 890 (GTK 890) - Credits: 180.00

MScAgric Horticulture (02255002)

Minimum duration of study	2 years

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master’s student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and

b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- A four-year Applied Plant Science degree or equivalent qualification with a minimum average of 60% is required for admission.
- In addition, a motivation letter reflecting research interest should accompany the application form.

Other programme-specific information

Note: Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Horticultural science 890 (TBK 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Horticultural science 890 (TBK 890) - Credits: 180.00

MScAgric Pasture Science (02255011)

Minimum duration of study	2 years

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

A four-year Applied Plant/Animal Science degree or equivalent qualification with a minimum average of 60% is required for admission.

In addition, a motivation letter reflecting research interest should accompany the application form.

Note:

- Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Other programme-specific information

Note: Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Pasture science 890 (WDE 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules

Dissertation: Pasture science 890 (WDE 890) - Credits: 180.00

MScAgric Plant Pathology (02255006)

Minimum duration of study	2 years

Programme information

Residence

On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration

As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum

Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 the BScAgric degree is a prerequisite for admission. An average of 60% is required in the final year of the BScAgric degree for admission. Additional requirements and conditions may be prescribed by the Dean on the recommendation of the head of department and the supervisor. Admission is approved by the Postgraduate Studies Committee in consultation with the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1
Minimum credits: 180

Core modules
Dissertation: Plant pathology 890 (PPT 890) - Credits: 180.00

Curriculum: Final year
Minimum credits: 180

Core modules
Dissertation: Plant pathology 890 (PPT 890) - Credits: 180.00

MScAgric Soil Science (02255012)

Minimum duration of study	2 years

Programme information

Residence
On the recommendation of the relevant head of department, the Dean may set specific residential requirements for the MScAgric degree.

Renewal of registration
As long as progress is satisfactory, renewal of the registration of a master's student will be accepted for the second year of the study. Registration for a third and subsequent years will only take place when the Student Administration of the Faculty receives a written motivation which is supported by the relevant head of department and Postgraduate Studies Committee.

Curriculum
Subject to programme-specific requirements, the curriculum for the MScAgric degree consists of the following:
a. A dissertation; and
b. Further study in the major subject/s, augmented by ancillary modules prescribed by the Postgraduate Studies Committee, on the recommendation of the head of department. Such ancillary modules may be taken simultaneously with the major subject/s. Candidates in possession of the BScAgricHons degree may be exempted from additional ancillary modules.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum period of registration and the requirements on the submission of a draft article for publication.

Admission requirements

A four-year Applied Soil Science degree or equivalent qualification with a minimum average of 60% is required for admission.

In addition, a motivation letter reflecting research interest should accompany the application form.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. The examinations in the ancillary modules should be successfully completed prior to, or simultaneously with, the examinations in the major subject/s, unless the Faculty Board decides otherwise.
ii. General Regulation G.12.2 applies to the calculation of marks.
iii. In order to obtain the MScAgric degree, the candidate must pass all prescribed modules, including the examination in the major subject/s, as well as the dissertation.

Curriculum: Year 1

Minimum credits: 180

Core modules

Dissertation: Soil science 890 (GDK 890) - Credits: 180.00

Curriculum: Final year

Minimum credits: 180

Core modules

Dissertation: Soil science 890 (GDK 890) - Credits: 180.00

Doctorate

PhD Actuarial Science (02260772)

Minimum duration of study	2 years

Programme information

A candidate must complete a thesis in one of several fields in which research is actively being done in the Department.

The programme consists of a thesis. Additional modules (as approved by the postgraduate coordinator) may be required depending on the candidate's background and the scope of the study. The research fields and the names of possible supervisors are available from the department at www.up.ac.za/actuarial.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

An appropriate master's degree is required for admission to doctoral study in actuarial science. The programme composition of the master's degree must have included a substantial research component that led to a dissertation reflecting originality either in the content or in the presentation. In the selection procedure the candidate's complete honours and master's academic records will be considered.

Admission is also subject to the availability of a suitable supervisor for the study.

Other programme-specific information

The minimum duration for this degree is two years. Subject to other faculty regulations, a student for a doctoral degree must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (In accordance with General Regulations G.47 and G.51.)

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.

ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Promotion to next study year

The progress of all doctoral candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Actuarial science 990 (AKW 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Actuarial science 990 (AKW 990) - Credits: 360.00

PhD Agricultural Economics (02261030)

Minimum duration of study	2 years

Programme information

This programme consists of a thesis and an oral examination.
All students need to follow a preparatory programme for the thesis which is not part of the degree programme. This preparatory programme should at least cover the following modules or their equivalents:

- Any two modules in economic or applied economic theory (eg Microeconomics or Macroeconomics)
- One module in quantitative methods (Econometrics, Applied econometrics, Quantitative methods, or Partial equilibrium modelling)
- One module in the field of specialisation (institutional economics, science and technology policy, food policy, etc)

If these modules or their equivalents have been completed sucessfully and a PhD proposal has been presented succesfully to and approved by the Department's postgraduate committee, the student may proceed to the research phase and the thesis. Students can be exempted from this preparatory programme if equivalent modules are completed at other universities and students could provide evidence that these prerequisites have been met.
For students with an MInstAgrar or similar qualification, additional modules might be recommended in order to ensure that the candidates' quantitative abilities are at the same level as someone entering the programme with an MScAgric.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.

ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).

iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

Admission is dependent upon the candidate being in possession of the MInstAgrar degree or MSc degree or an equivalent appropriate degree with the status thereof as evaluated by the head(s) of the particular department(s).

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Agricultural economics 991 (LEK 991) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Agricultural economics 991 (LEK 991) - Credits: 360.00

PhD Agronomy (02260803)

Minimum duration of study	2 years

Programme information

This programme is coordinated in the Department of Plant and Soil Science.

In addition to further theoretical studies as prescribed by the head(s) of the relevant department(s), the study

will involve a doctoral research thesis under guidance of a supervisor selected by the head of department. The supervisor will be a member of the Faculty staff.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at

conferences and of material that has been submitted for publication and/or published.

ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MScAgric (Agronomy) or applicable research master's qualification
- At least 60% for the dissertation component in the preceding degree
- A research proposal
- Prospective students depending on their academic background and the chosen area of study, may be required to do additional coursework

Additional requirements

In addition to meeting the admission requirements, a research proposal should accompany the application form. Selection of students will be based on academic performance, the written research proposal, available supervisory capacity and research project funding.

Other programme-specific information

Depending on the academic background of the student and the chosen area of study, it may be required of the student to do additional coursework.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules
Thesis: Agronomy 990 (AGR 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Agronomy 990 (AGR 990) - Credits: 360.00

PhD Air Quality Management (02261045)

Minimum duration of study	2 years

Programme information

Coordinated by the Department of Geography, Geoinformatics and Meteorology.

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The extensions to the National Environmental Management Act (NEMA) promulgated after 2005 affect environmental management in South Africa in a profound way. In particular, the Air Quality Act brings South African legislation into line with international trends. The metro councils are charged with the responsibility of implementing the Act at the local level. In addition, companies need appropriate expertise to obtain licenses for their air quality management plans. This focus area serves to provide suitable expertise for the implementation of the above legislation by industry by training graduates specialised for careers in air quality management. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning the legislative requirements with respect to air quality management, modelling of and measurement of air pollution and the interpretation of pollution plumes, the measurement and interpretation of chemical air pollution as well as dust pollution, international agreements and requirements as well as the effects of air pollution on humans.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MSc (Air Quality Management) or an equivalent degree
- Applicants needs to prove that they published one research paper in an open scientific literature (i.e. peer-reviewed professional research journals)
- At least a final grade point average of 65% for the preceding degree.
- SAQA evaluation compulsory. (NQF level 9 required)

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Air quality management 998 (ENV 998) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Air quality management 998 (ENV 998) - Credits: 360.00

PhD Animal Production Management (02260548)

Minimum duration of study	2 years

Programme information

This programme is coordinated in the Department of Animal and Wildlife Sciences.

In addition to further theoretical studies as prescribed by the head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the head of department. The supervisor will be a member of the Faculty staff.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live

on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for

consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

The minimum admission requirements are an MAgric or MScAgric degree in Animal Production or an equivalent appropriate qualification. Dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Animal production 990 (APZ 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Animal production 990 (APZ 990) - Credits: 360.00

PhD Animal Science (02261050)

Minimum duration of study	2 years

Programme information

The curriculum for the PhD degree programme consists of the following:

i. A theoretical knowledge of the major subject/s and such additional modules as may be prescribed (Animal science modules at 800-level).
ii. A thesis.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.

v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the

department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

MScAgric with specialisation in Animal Science or an equivalent applicable degree. Dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Animal science 990 (VKU 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Animal science 990 (VKU 990) - Credits: 360.00

PhD Biochemistry (02260442)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since

registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a

report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

Candidates must have obtained 60% or more for a MSc (Biochemistry) or equivalent degree. Alternatively, the Head of Department may provide a recommendation for admission to the Faculty Board. The level of proficiency of qualifying candidates may further be assessed by an entrance evaluation examination. Admission is also contingent upon the availability of supervisors and/or research projects in the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Project and thesis 990 (BCM 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Project and thesis 990 (BCM 990) - Credits: 360.00

PhD Bioinformatics (02261020)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.

v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the

department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- Students must be in possession of an MSc degree in Bioinformatics or an equivalent thereof.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Bioinformatics 990 (BIF 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Bioinformatics 990 (BIF 990) - Credits: 360.00

PhD Biotechnology (02261021)

Minimum duration of study	2 years

Programme information

This is an interdepartmental programme.
The curriculum is to be determined by the heads of the participating departments. Please consult with Prof P Bloomer, Tel: 012 420 3259, for further details.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.

iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability

of the candidate as a potential doctoral candidate is confirmed.

v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Agronomy 990 (AGR 990) - Credits: 360.00
Project and thesis 990 (BCM 990) - Credits: 360.00
Thesis: Plant science 990 (BOT 990) - Credits: 360.00
Thesis: Genetics 990 (GTK 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Agronomy 990 (AGR 990) - Credits: 360.00
Project and thesis 990 (BCM 990) - Credits: 360.00
Thesis: Plant science 990 (BOT 990) - Credits: 360.00
Thesis: Genetics 990 (GTK 990) - Credits: 360.00

PhD Chemistry (02260453)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.

ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).

iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate MSc degree is a prerequisite for admission to PhD studies.
- Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor. Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Chemistry 990 (CHM 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Chemistry 990 (CHM 990) - Credits: 360.00

PhD Consumer Science Clothing Management (02263006)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential

doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).

iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.

v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General

Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

MConsumer Science or applicable master's degree with a pass mark of at least 60%.

To proceed with the thesis a student should have fulfilled the requirements for the master's degree regarding the following modules or modules with similar content and scope including publication record:

- Theoretical frameworks;
- Research methodology 814 (NMN 814) or similar module of the same level and scope;
- The student has published at least one article in an accredited/refereed research journal during the two years prior to registration for the PhD degree or can prove that one has been accepted in an accredited/refereed journal.

It must be evident from the master's dissertation or publications based on it that the candidate is able to undertake research independently.

Note:

- It may be required from the student to do additional coursework.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.

ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

PhD Consumer Science Development (02263007)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

MConsumer Science or applicable master's degree with a pass mark of at least 60%.

To proceed with the thesis a student should have fulfilled the requirements for the master's degree regarding the following modules or modules with similar content and scope including publication record:

- Theoretical frameworks;
- Research methodology 814 (NMN 814) or similar module of the same level and scope;
- The student has published at least one article in an accredited/refereed research journal during the two years prior to registration for the PhD degree or can prove that one has been accepted in an accredited/refereed journal.

It must be evident from the master's dissertation or publications based on it that the candidate is able to undertake research independently.

Note:

It may be required from the student to do additional coursework.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

PhD Consumer Science Food Management (02263008)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

MConsumer Science or applicable master's degree with a pass mark of at least 60%.

To proceed with the thesis a student should have fulfilled the requirements for the master's degree regarding the following modules or modules with similar content and scope including publication record:

- Theoretical frameworks;
- Research methodology 814 (NMN 814) or similar module of the same level and scope;
- The student has published at least one article in an accredited/refereed research journal during the two years prior to registration for the PhD degree or can prove that one has been accepted in an accredited/refereed journal.

It must be evident from the master's dissertation or publications based on it that the candidate is able to undertake research independently.

Note:

It may be required from the student to do additional coursework.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

PhD Consumer Science Interior Merchandise Management (02263005)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

MConsumer Science or applicable master's degree with a pass mark of at least 60%.

To proceed with the thesis a student should have fulfilled the requirements for the master's degree regarding the following modules or modules with similar content and scope including publication record:

- Theoretical frameworks;

- Research methodology 814 (NMN 814) or similar module of the same level and scope;

- The student has published at least one article in an accredited/refereed research journal during the two years prior to registration for the PhD degree or can prove that one has been accepted in an accredited/refereed journal.

It must be evident from the master's dissertation or publications based on it that the candidate is able to undertake research independently.

Note:

It may be required from the student to do additional coursework.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Consumer Science 990 (VBR 990) - Credits: 360.00

PhD Engineering and Environmental Geology Hydrogeology (02260524)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.

iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.

v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62, an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Hydrogeology 990 (GTX 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Hydrogeology 990 (GTX 990) - Credits: 360.00

PhD Engineering and Environmental Geology (02260547)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.

iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability

of the candidate as a potential doctoral candidate is confirmed.

v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62, an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Engineering geology 990 (IGL 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Engineering geology 990 (IGL 990) - Credits: 360.00

PhD Engineering Geology (02260546)

Minimum duration of study	2 years

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Engineering geology 990 (IGL 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Engineering geology 990 (IGL 990) - Credits: 360.00

PhD Entomology (02260242)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 the MSc MScAgric MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the Head of Department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Entomology 990 (ENT 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Entomology 990 (ENT 990) - Credits: 360.00

PhD Environment and Society (02261040)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

The programme is coordinated by the Department of Geography, Geoinformatics and Meteorology.

The purpose of this focus area is to train environmental graduates who specialised in careers in the humanities. On completion of the training, candidates should be conversant and be able to partake in, or render advice concerning, all aspects involved in the management of human-environment interactions. This includes social impact assessments, policy formulation, social development and planning, participatory appraisal assessments, demographic pattern and trend interpretations, resource appraisals and management.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

Admission is dependent on the candidate being in possession of an MSc in Environment and Society or an equivalent degree with the status thereof as evaluated by the Director of the Centre and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s) the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the

University of Pretoria.

Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Environment and society 991 (ENV 991) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Environment and society 991 (ENV 991) - Credits: 360.00

PhD Environmental Economics (02261041)

Minimum duration of study	2 years

Programme information

This programme is coordinated in the Department of Agricultural Economics, Extension and Rural Development.

All students need to follow a preparatory programme for the thesis which is not part of the degree programme. This preparatory programme should at least cover the following modules or their equivalents:

- Any two modules in economic or applied economic theory (e.g. Microeconomics or Macroeconomics)
- One module in quantitative methods (Econometrics, Applied econometrics, Quantitative methods, or Partial equilibrium modelling
- One module in the field of specialisation (institutional economics, science and technology policy, food policy, etc)

If these modules or their equivalents are successfully completed and a PhD proposal has been successfully presented and approved by the Department’s postgraduate committee, the student may proceed to the research phase and the thesis. Students can be exempted from this preparatory programme if equivalent modules are completed at other universities and students could provide evidence that these prerequisites have been met.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.

iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.

v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an MSc in Environmental Economics or an equivalent degree with the status thereof as evaluated by the Director of the Centre and the head(s) of the particular department(s). In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department(s) the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department. The supervisor will be a suitable academic staff member of the University of Pretoria.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Environmental economics 993 (ENV 993) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Environmental economics 993 (ENV 993) - Credits: 360.00

PhD Environmental Management (02261042)

Minimum duration of study	2 years

Programme information

The Centre for Environmental Studies is a graduate school for multidisciplinary training and research focusing on

the environment. Training aims to satisfy the need for environmental professionals for implementing current environmental legislation as well as industry-driven environmental management systems.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at

conferences and of material that has been submitted for publication and/or published.

ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- Applicants need to prove that theypublished one research paper in an open scientific literature (i.e. peer-reviewed professional research journals

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Environmental management 994 (ENV 994) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Environmental management 994 (ENV 994) - Credits: 360.00

PhD Extension (02260900)

Minimum duration of study	2 years

Programme information

The programme consists of:

- Original research leading to a thesis
- An examination on the thesis

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must

provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.

ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of the General Regulations, the MSc, MScAgric, MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Extension 990 (AGV 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Extension 990 (AGV 990) - Credits: 360.00

PhD Food Science (02261060)

Minimum duration of study	2 years

Programme information

The degree is awarded based on a thesis and other requirements as follows: Candidates must write a thesis on their research project in Food Science and have at least a research paper accepted for publication in a peer-reviewed scientific journal.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62, the MSc, MScAgric, MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Food science 990 (FST 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Food science 990 (FST 990) - Credits: 360.00

PhD Forest Science (02260802)

Minimum duration of study	2 years

Programme information

This is an interdepartmental programme. The curriculum is to be determined by the heads of department in the biological sciences.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 the MSc, MScAgric, MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Forest Science 990 (FOR 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Forest Science 990 (FOR 990) - Credits: 360.00

PhD Genetics (02260502)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the

student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Genetics 990 (GTK 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Genetics 990 (GTK 990) - Credits: 360.00

PhD Geography (02260513)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Geography 990 (GGF 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Geography 990 (GGF 990) - Credits: 360.00

PhD Geoinformatics (02260514)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Geoinformatics 990 (GIS 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Geoinformatics 990 (GIS 990) - Credits: 360.00

PhD Geology (02260523)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Geology 990 (GLG 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Geology 990 (GLG 990) - Credits: 360.00

PhD Horticultural Science (02260806)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MScAgric (Horticultural Science) or other applicable research master's qualification with a pass mark of at least 60% for the dissertation component.
- In addition to meeting the admission requirements, a research proposal should accompany the application form.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Horticultural science 990 (TBK 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Horticultural science 990 (TBK 990) - Credits: 360.00

PhD Mathematical Sciences (02260762)

Minimum duration of study	2 years

Programme information

A candidate must complete a thesis in one of several fields in which research is actively being done in the Department. The research fields and the names of possible supervisors are available from the departmental postgraduate brochure at: www.up.ac.za/maths/postgrad

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

An appropriate master's degree is required for admission to doctoral study in Mathematics and Applied Mathematics. The programme composition of the master's degree must have included a heavy research component that led to a dissertation reflecting originality either in the content or in the presentation. In the selection procedure the candidate's complete honours and master's academic records will be considered. In particular it is required that the master's degree be obtained with distinction. If a candidate did not pass his/her master's degree with distinction he/she may submit an application together with a motivation by his/her potential supervisor to the postgraduate coordinator.

Admission is also subject to the availability of a suitable supervisor for the study.

Other programme-specific information

Subject to other faculty regulations, a student for a doctoral degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (Also see the General Regulations.)

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Promotion to next study year

The progress of all doctoral candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate's study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Applied Mathematics 990 (TWS 990) - Credits: 360.00
Thesis: Mathematics 990 (WIS 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Applied Mathematics 990 (TWS 990) - Credits: 360.00
Thesis: Mathematics 990 (WIS 990) - Credits: 360.00

PhD Mathematical Statistics (02260612)

Minimum duration of study	2 years

Programme information

A candidate must complete a thesis in one of several fields in Applied Statistics or Mathematical Statistics in which research is actively being done within the Department. Details are available from the Head of Department of Statistics as well as in the departmental brochure. Refer to the Departmental website for further information.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the

relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration

of study and the requirements to submit an article/s for publication.

Admission requirements

(i) A relevant Master's degree in Mathematical Statistics or Applied Statistics is required. For PhD (Mathematical Statistics) and PhD (Applied Statistics) a minimum average mark of 65% or more

- in the MSc (Mathematical Statistics) or MSc (Applied Statistics) or
- in an applicable master's degree at an accredited institution is required.

(ii) Students from other accredited institutions will be required to pass an entrance examination.

(iii) Student numbers are limited to a maximum of 10, collectively over all doctoral programmes in the Department of Statistics. Selection is based on performance in the prior degree, conditional on ii and iii above.

(iv) Admission is also subject to the availability of a suitable supervisor for the study.

(v) Additional entrance requirements as specified by the head of the department.

Other programme-specific information

Subject to other faculty regulations, a student for a doctoral degree must complete his or her studies within four years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the head of department, may give approval for a limited fixed extension of this period. (Also see the General Regulations.)

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Promotion to next study year

The progress of all doctoral candidates is monitored biannually by the supervisor and the postgraduate coordinator. A candidate’s study may be terminated if the progress is unsatisfactory or if the candidate is unable to finish his/her studies during the prescribed period.

Curriculum: Year 1

Minimum credits: 360

All doctoral students in Statistics/Mathematical Statistics should enrol for STK 911 which is a compulsory but non-credit-bearing module. The satisfactory completion of this module is a prerequisite for embarking on the research component of the degree programme.

Core modules

Research orientation 911 (STK 911) - Credits: 0.00
Thesis: Mathematical statistics 990 (WST 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules
Research orientation 911 (STK 911) - Credits: 0.00
Thesis: Mathematical statistics 990 (WST 990) - Credits: 360.00

PhD Medicinal Plant Science (02260800)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MSc in Medicinal Plant Science or an MSc in Plant Science 60% or a recommendation from the head of department. A minimum of 60% is required in the compulsory modules BOT 761, BOT 748 and BOT 749 which are offered at honours level in the Department of Plant and Soil Science.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Medicinal plant science 990 (MPS 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Medicinal plant science 990 (MPS 990) - Credits: 360.00

PhD Meteorology (02260632)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1

Minimum credits: 360

Core modules

Thesis: Meteorology 990 (AWM 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Meteorology 990 (AWM 990) - Credits: 360.00

PhD Microbiology (02260562)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Microbiology 990 (MBY 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Microbiology 990 (MBY 990) - Credits: 360.00

PhD Nutrition (02260742)

Minimum duration of study	2 years

Programme information

Candidates must write a thesis on their research project in Nutrition and have at least a research paper accepted for publication in a peer-reviewed scientific journal.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62, the MSc, MScAgric, MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.
- International qualifications have to be evaluated by SAQA.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Nutrition 990 (VDG 990) - Credits: 360.00

Curriculum: Final year

Minimum credits: 360

Core modules

Thesis: Nutrition 990 (VDG 990) - Credits: 360.00

PhD Pasture Science (02260804)

Minimum duration of study	2 years

Programme information

This programme is coordinated in the Department of Plant and Soil Science.

In addition to further theoretical studies as prescribed by the head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the head of the department. The supervisor will be a member of the Faculty staff.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is

capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MScAgric (Animal/Pasture Science) or applicable research master's degree
- At least 60% for the dissertation component in the preceding degree
- A research proposal

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Pasture science 990 (WDE 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Pasture science 990 (WDE 990) - Credits: 360.00

PhD Physics (02260482)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the

student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Other programme-specific information

Additional modules may be prescribed by the head of department. The contents of the coursework will be determined by the supervisor and head of department to supplement the subject of the thesis of the student.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Physics 990 (FSK 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Physics 990 (FSK 990) - Credits: 360.00

PhD Plant Pathology (02261070)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the

student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.

c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 the MSc, MScAgric, MInstAgrar or other appropriate degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the head of department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and

- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Plant pathology 990 (PPT 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Plant pathology 990 (PPT 990) - Credits: 360.00

PhD Plant Science (02260801)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the

master's degree to registration for a doctoral degree.

b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MSc in Plant Science or an MSc in Medicinal Plant Science 60% or a recommendation from the head of department.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;

- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Plant science 990 (BOT 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Plant science 990 (BOT 990) - Credits: 360.00

PhD Rural Development (02260901)

Minimum duration of study	2 years

Programme information
In addition to further theoretical studies as prescribed by the head(s) of the relevant department(s), the study will involve a doctoral research thesis under guidance of a supervisor selected by the head of the department. The supervisor will be a member of the Faculty staff.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- Admission is dependent upon the candidate being in possession of the MAgric degree or an equivalent appropriate degree with the status thereof as evaluated by the head(s) of the particular department(s).
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Rural development 990 (ARD 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Rural development 990 (ARD 990) - Credits: 360.00

PhD Science and Mathematics Education (02260754)

Minimum duration of study	2 years

Programme information

The programme is designed for science educators at all levels who wish to pursue their postgraduate studies in science education but closely allied with a scientific discipline. Science, in this context, is interpreted in its broadest sense, and includes the physical, biological and earth sciences, as well as mathematics and technology.

At the end of this programme the student will be capable of doing independent research within the values and approaches of the sciences, and their impact and role in the broader social and economic environment with an educational focus.

For admission to the PhD in Science and Mathematics Education, the programme composition of the master's degree must have included a reasonable research component that led to a dissertation.

Applicants seeking admission in the PhD Science and Mathematics Education programme should indicate their particular field of specialization, i.e. Science Education or Mathematics Education. For Science Education, please refer to the Centre for Science, Mathematics and Technology Education. For students specialising in Mathematics Education, the contact department is the Department of Mathematics and Applied Mathematics.

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- A candidate must demonstrate expertise in education research methodology (including relevant statistical methods) and in current thinking in the field with the understanding that a candidate who does not satisfy the required level of expertise may be admitted on condition that additional agreed study assignments are completed and/or examinations passed.
- The status of a master's degree, subject to faculty regulations as well as the General Regulations.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Science education 990 (SCE 990) - Credits: 360.00
Thesis: Mathematics Education 993 (WTW 993) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Science education 990 (SCE 990) - Credits: 360.00
Thesis: Mathematics Education 993 (WTW 993) - Credits: 360.00

PhD Soil Science (02260805)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since

registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a

report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MScAgric (Soil Science) or other applicable research master's qualification with a pass mark of at least 60% for the dissertation component.
- In addition to meeting the admission requirements, a research proposal should accompany the application form.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Soil science 990 (GDK 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Soil science 990 (GDK 990) - Credits: 360.00

PhD Water Resource Management (02261043)

Minimum duration of study	2 years

Programme information

Duration of studies
The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor’s degree.
ii. At least three years after complying with all the requirements for a four-year bachelor’s degree.
iii. At least two years after complying with all the requirements for a bachelor’s degree of five years or more.
iv. At least two years after complying with all the requirements for a master’s degree.

v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration
Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum
The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study
The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the

department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- Admission is dependent on the candidate being in possession of an MSc in Water Resource Management or an equivalent degree with the status thereof as evaluated by the Director of the Centre for Environmental Studies and the head(s) of the particular department(s).
- In addition to further theoretical studies as prescribed by the Director and head(s) of the relevant department, the study will involve a doctoral research thesis under guidance of a supervisor selected by the Director and head of department during which the student needs to prove that he/she can publish at least one research paper in an international peer-reviewed scientific journal. The supervisor will be a suitable academic staff member of the University of Pretoria.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Other programme-specific information

Additional possible electives in Environmental studies
Any module at master's level in either diplomatic studies or political policy studies as approved by the Head of the Department of Political Sciences and the Director of the Centre for Environmental Studies.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Water resource management 990 (ENV 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Water resource management 990 (ENV 990) - Credits: 360.00

PhD Wildlife Management (02260662)

Minimum duration of study	2 years

Programme information

Research project with thesis only.

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.

b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- MSc in Wildlife Management or an equivalent applicable degree.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Wildlife management 990 (NLB 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Wildlife management 990 (NLB 990) - Credits: 360.00

PhD Zoology (02260462)

Minimum duration of study	2 years

Programme information

Duration of studies

The doctorate is conferred on a student only if one of the following periods has expired:

i. At least four years after complying with all the requirements for a three-year bachelor's degree.
ii. At least three years after complying with all the requirements for a four-year bachelor's degree.
iii. At least two years after complying with all the requirements for a bachelor's degree of five years or more.
iv. At least two years after complying with all the requirements for a master's degree.
v. With the exception of a shorter period that may be approved by the Dean, at least 12 months since registration for the doctorate at this University has expired.

The relevant head of department may set specific residential requirements for students who are required to live on campus.

Renewal of registration

Subject to other faculty regulations, a student for a doctorate must complete his or her studies within three years after first registering for the degree. Under special circumstances, the Dean, on the recommendation of the relevant head of department or the Postgraduate Committee, may give approval for a limited fixed extension of this period.

Curriculum

The curriculum for the PhD degree consists of the following:

i. Theoretical knowledge of the major subject/s and such additional modules as may be prescribed.
ii. A thesis.

Conversion of a master's to doctoral study

The stipulations of G.41 apply as follows:

1. Requirements

a. Under special circumstances, the dean of a faculty may convert the registration of a candidate for the master's degree to registration for a doctoral degree.
b. For such conversions, the relevant head of department and the supervisor must be satisfied that the student's completed work is of the standard that would be expected of a doctoral student, that the student is capable of completing a doctoral degree, and that the project is of appropriate standard and scope to constitute a doctoral study.
c. For such conversions, the relevant head of department and the supervisor must be satisfied that the student has demonstrated that he or she has the potential to fulfil the requirements of a doctoral degree without having completed a master's degree.

2. Process

a. Application for conversion may be submitted at any time during the course of study for the master's degree.
b. The application for the conversion must include the following documentation:

i. A detailed progress report by the candidate of the work completed for the master's project. The report must provide proof that the results obtained thus far are of such a standard and scientific significance that they justify conversion to a doctoral project. The report should include details of presentations made at conferences and of material that has been submitted for publication and/or published.
ii. A detailed proposal for the intended doctoral project, written by the candidate, including the objectives of the project.
iii. A recommendation by the supervisor with specific comments on the ability of the applicant as a potential doctoral candidate as well as the feasibility of the conversion, especially with regard to the information provided by the candidate in his/her reports (items (i) and (ii)).
iv. A recommendation by the relevant head of department, if he or she is not the supervisor, in which the ability of the candidate as a potential doctoral candidate is confirmed.
v. If the Dean considers it advisable for the faculty, the candidate may be required to present a seminar to the department in support of the application. In this case, the relevant head of department should include a report on this in his or her recommendation.

c. The application of the candidate, together with the reports and recommendations, is submitted for consideration to the Dean, (who may delegate to the Chairperson of the Faculty Postgraduate Committee) for approval. The decision should be submitted to the Faculty Board for approval.

General
Candidates are required to familiarise themselves with the General Regulations regarding the maximum duration of study and the requirements to submit an article/s for publication.

Admission requirements

- In addition to the requirements of General Regulations G.1.3 and G.62 an appropriate MSc degree is a prerequisite for admission to PhD studies. Additional requirements and conditions can be specified by the Dean on the recommendation of the Head of Department and the supervisor.
- Admission is additionally dependent on availability of supervisor/s and/or projects within the department.

Examinations and pass requirements

i. Consult the General Regulations that apply to the calculation of marks.
ii. In order to obtain the PhD degree the candidate must:

- pass the examinations and the prescribed modules, as determined in the study programme;
- pass the thesis; and
- pass the final examination on the thesis and general subject knowledge.

Curriculum: Year 1
Minimum credits: 360

Core modules
Thesis: Zoology 990 (ZOO 990) - Credits: 360.00

Curriculum: Final year
Minimum credits: 360

Core modules
Thesis: Zoology 990 (ZOO 990) - Credits: 360.00

Modules

Labour relations 320 (ABV 320)

Qualification	Undergraduate
Module credits	20.00
Programmes	BConSci Food Retail Management BConSci Hospitality Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Human Resource Management
Period of presentation	Semester 2

Module content

The theoretical basis of Labour Relations
In this section the basic concepts, historical context and theoretical approaches to the field of labour relations will be discussed. The institutional framework in which labour relations operates, will be addressed with particular emphasis on the structural mechanisms and institutional processes. The service relationship that forms the basis of labour relations practices, will also be analysed.
Labour Relations practice
In this section students are taught the conceptual and practical skills related to practice aspects such as handling of grievances, disciplining, retrenchments, collective bargaining, industrial action and dispute resolution.

Field crops 361 (AGR 361)

Qualification	Undergraduate
Module credits	14.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	PPK 251
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Botanical characteristics, classification, growth requirements, production practices and utilization of crops rich in starch, oil and protein, fibre crops, tobacco, sugarcane and medicinal plants. Visits to research institutions and producers.

Vegetable crops 410 (AGR 410)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management BScAgric Applied Plant and Soil Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Integration of agronomic, pedological, botanical, economic and management considerations in crop production systems with a view to sustainable maximum economic yield. Case studies of specific crops.

Crop production systems (I): Field crops 785 (AGR 785)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Integrated agronomic, climatic, soil, botanical, economic and managerial considerations in crop production systems aimed at maximum economic yield and sustainability. Case studies of specific field crops.

Crop production systems (II): Vegetable crops 786 (AGR 786)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Integrating agronomic, climatic, soil, botanical, economic and managerial considerations in crop production systems aimed at maximum economic yield and sustainability. Case studies of specific vegetable crops.

Advanced coursework 801 (AGR 801)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Any module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

Dissertation: Agronomy 890 (AGR 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Agronomy MSc Biotechnology MScAgric Agronomy
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presentation of the research results. In addition to the dissertation, the student is also expected to compile a concept research paper for publication in a peer-reviewed UP accredited scientific journal.

Mini-dissertation: Agronomy 891 (AGR 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Plant and Soil Sciences
Period of presentation	Year

Module content

Each candidate must write a mini-dissertation on his/her research project in Agronomy and at least prepare a concept research paper for publication in a peer-reviewed scientific journal.

Thesis: Agronomy 990 (AGR 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Biotechnology PhD Agronomy PhD Biotechnology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presenting of the research results. In addition to the thesis, the student is also expected to publish at least one research paper in a peer-reviewed, UP accredited scientific journal. An oral examination covering Pasture Science and other fields related to the thesis will be conducted after the thesis has been accepted by examiners. A candidate needs to pass both the written thesis and oral examination to qualify for the degree.

Communication 421 (AGV 421)

Qualification	Undergraduate
Module credits	16.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Prerequisites	Second Year - Academic level
Contact time	2 lectures per week
Language of tuition	Separate classes for Afrikaans and English

Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Communication: Definition and clarification of concepts. Theory and elements of communication. Verbal and non-verbal communication. Determinants of interpersonal communication. Abating factors impeding communication. Nature, classification and efficiency of communication channels.

Leadership and group dynamics 712 (AGV 712)

Qualification	Postgraduate
Module credits	20.00
Programmes	BAgricHons Rural Development BAgricHons Extension BAgricHons Rural Development
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Nature, philosophy and objectives of Extension. The group as channel and instrument in extension; definitions and characteristics of groups; group formation; theories regarding the functioning of groups; group norms; group goals; small group techniques; rural groups and their engagement; definitions and theories of leadership; behaviour and attitude in group work; the extensionist as professional leader; group analysis in group context and process; training of leaders. Conflict resolution, mediation and negotiation. Ethics in extension and agricultural development. Management in extension; Strategic planning; functions of management.

Communication for sustainable rural development 713 (AGV 713)

Qualification	Postgraduate
Module credits	15.00
Programmes	BAgricHons Rural Development BAgricHons Extension BAgricHons Rural Development
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Introduction to the Communication Process, its role and importance. Communication and perception - role of Extension in AKIS. Clarification of principles and definitions; theory of communication; Strategies for communication and Extension methods. Key elements and channels of communication; credibility; persuasion; public speaking; audio visual aids; mass media and their effect; new reporting; articles and newsletters. Designing communication interventions. Impact assessment approaches and tools. Appreciative Communication Inquiry: 5-D Approach.

Principles and approaches of rural development and extension 715 (AGV 715)

Qualification	Postgraduate
Module credits	15.00
Programmes	BAgricHons Rural Development BAgricHons Extension BAgricHons Rural Development
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Overview of the origin, role, development of extension; Philosophy and principles of extension. International approaches to extension delivery: Training and Visit, Farming system development, Project approach, Farmer Field Schools, Participatory Extension and Participatory Technology Development. Extension's role in sustainable agriculture development; Adult learning principles, privatizing and outsourcing of agricultural extension; the role of non-governmental organisations (NGO's) in extension delivery. Decentralisation of extension. Participation and coordination of stakeholders in the planning of linkages between extension, research and the farming community.

Extension programme planning and management 726 (AGV 726)

Qualification	Postgraduate
Module credits	20.00
Programmes	BAgricHons Extension BAgricHons Extension
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Nature, purpose and principles of a programmed and purposeful Extension. The philosophy, principles and assumptions of program development. Institutional framework for community participation, ownership and empowerment; linking with complementary and support services. Overview of the program cycle: consideration, survey, planning, action and evaluation phases. Participatory need appraisal, problem identification and delimination; problem conceptualisation and development of survey instrument; situation surveys and analysis; formulation of objectives; identification and scheduling of methods and activities; Work plan of calendar construction, budgeting. The project management process. Personnel management and administration.

Extension programme evaluation and research 728 (AGV 728)

Qualification	Postgraduate
Module credits	30.00
Programmes	BAgricHons Extension BAgricHons Extension
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Meaning, scope and place of evaluation in extension; the research- and evaluation process; problem identification; theory and hypotheses; objectives; literature research and information sources; sampling; methods of data collection; evaluation criteria; quality of measuring instruments; scale construction; interviewing. Conducting research and reporting research findings. Preparation of an evaluation report of an extension programme/project.

Human and organisational behaviour change and management 729 (AGV 729)

Qualification	Postgraduate
Module credits	20.00
Programmes	BAgricHons Extension BAgricHons Extension
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Understanding change and the time lag phenomenon. Principles of human behaviour and its influence on change. Theoretical perspectives on behaviour change. Understanding resistance and barriers to change. Adoption and diffusion of new innovations. Theories and models of decision-making. Introduction to organisational dynamics; Role of Extension organisations in Rural Development. Theoretical perspectives on organisational change; organisations as rationale and open systems. Understanding organisations and society; organisational pathologies; organisational effectiveness.

Agrarian extension 800 (AGV 800)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Dissertation: Agrarian Extension 890 (AGV 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Agricultural Extension MAgric Extension and Rural Development MScAgric Agricultural Extension
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Mini-dissertation: Extension 891 (AGV 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Thesis: Extension 990 (AGV 990)

Qualification	Postgraduate
Module credits	360.00

Programmes	PhD Extension PhD Extension
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Academic information management 101 (AIM 101)

Qualification	Undergraduate
Module credits	6.00
Programmes	BTh
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Information Science
Period of presentation	Semester 1

Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology. Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

Academic information management 102 (AIM 102)

Qualification	Undergraduate
Module credits	6.00

Programmes	BVSc BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematical Statistics BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Information Science

Period of presentation Semester 2

Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology. Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

Academic information management 111 (AIM 111)

Qualification	Undergraduate
Module credits	4.00

Programmes	Diploma in Theology BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematical Statistics BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion
Prerequisites	No prerequisites.
Contact time	2 lectures per week

Language of tuition	Module is presented in English
Department	Information Science
Period of presentation	Semester 1

Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.

Academic information management 121 (AIM 121)

Qualification	Undergraduate
Module credits	4.00

Programmes	Diploma in Theology BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematical Statistics BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.

Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

Dissertation: Actuarial science 890 (AKW 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Actuarial Science MSc Actuarial Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Year

Thesis: Actuarial science 990 (AKW 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Actuarial Science PhD Actuarial Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Year

Introduction: Human anatomy and embryology 121 (ANA 121)

Qualification	Undergraduate
Module credits	4.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	MLB 111 and CMY 117; Only for BSc Medical Sciences students.
Contact time	1 lecture per week, 1 practical per week

Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Terminology, musculo-skeletal system, nervous system, surface anatomy, cardiovascular system, respiratory system, urogenital system, gastro-intestinal system, endocrine system, introductory osteology and joints, introductory embryology.

Human osteology 122 (ANA 122)

Qualification	Undergraduate
Module credits	4.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only for BSc Medical Sciences students.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Introduction to osteology, bone function and classification, humerus, radius, ulna, femur, tibia, fibula, clavicle, scapula, ribs, sternum, vertebrae, pelvis, hand and foot bones, sesamoid bones, skull, mandible, joints.

Basic human histology 126 (ANA 126)

Qualification	Undergraduate
Module credits	4.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	CMY 117 and MLB 111; Only for BSc Medical Sciences students.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content
General introduction to cells and tissue, terminology, the cell and cytoplasm, organelles and inclusions, surface and glandular epithelium, general connective tissue, specialised connective tissue, namely cartilage, bone, blood and haemopoietic tissue, muscle and nervous tissue.

Human cell and developmental biology 214 (ANA 214)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 121 and ANA 126 and CMY 127
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 1

Module content

Functional review of the cell and cell content. Normal and abnormal cell function in relation to structure. Control of the human cell, heredity and the human genome. Cell communication, growth and development, adhesion and division. Aspects of cellular research. Techniques on how to study cells. Medical cell and molecular biology application.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Paleoanthropology 215 (ANA 215)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 1

Module content

Introduction to paleoanthropology, focusing on hominid fossil record, principles of evolution, principles of heredity, human variation, introduction to primatology, hominid taxonomy, time-frames and dating methods, fossilisation and taphonomy, trends in hominid evolution, hominid sites. Australopithecus, homo habilis, homo erectus, homo sapiens neanderthalensis, the origin of anatomically modern human beings, DNA studies, palaeo-environments, hominid diets, introduction to the development of culture, South African populations, human adaptation and modernisation.

Human histology 226 (ANA 226)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 126
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

General introduction to organ structure.
Terminology. The eye, ear, skin, circulatory system, nervous system, lymphoid system, gastrointestinal tract, gastrointestinal tract glands, respiratory system, urinary system, male and female reproductive systems, endocrine system.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Human anatomy Part 1 247 (ANA 247)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 121, ANA 122 and CMY 127
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Regional approach to human anatomy. Cadaver dissection of the head, neck as well as neuro-anatomy. Anatomical techniques.

NOTE: This module is not open to all students and may only be taken by BSc (Medical Sciences) students.

Forensic anthropology 315 (ANA 315)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 122, ANA 215
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 1

Module content

Introduction to forensic anthropology, detection of graves, excavation of graves, human vs. animal bone, forensic entomology, osteometry, cranial and post-cranial measurements, non-metric features of the skeleton, age determination, sex determination, race determination, ante-mortem stature, dental analysis, osteopathology, factors of individualisation, measurements of the face, introduction to face mapping and skull-photo superimposition, legal aspects. NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Cell and tissue techniques 316 (ANA 316)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 226
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 1

Module content

General introduction to light and electron microscopic techniques: fixation, processing, imbedding, staining. Principles of different staining techniques for LM and EM: routine stains, proteins, carbohydrates, amino acids, metachromasia, immunocytochemistry, lectin stains, specialised stains. Principles of the operation of LM and EM: general LM, fluorescent microscopy, differential contrast microscopy, dark field microscopy, phase contrast microscopy, transmission and scanning electron microscopy.

Human cell and developmental biology 324 (ANA 324)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 214, ANA 226
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Practical aspects of cell biology. Cell, tissue, organ, and organism culture. The biology of the culture environment. Cellular basic of morphogenesis, cleavage patterns and gastrulation. The early vertebrate development; neurilation, ecto-, meso- and endoderm derivatives. Cell destiny and embryonic axis including malformations. Development of the tetrapod limb and cell death. Cell interactions at a distance through hormones and metamorphosis.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Comparative anatomy 327 (ANA 327)

Qualification	Undergraduate
Module credits	18.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 121, ANA 122, ANA 217, ANA 227
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Introduction to comparative anatomy. Introduction to comparative osteology. Comparative anatomy of the appendicular skeleton. Comparative anatomy of the axial skeleton.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Applied research techniques 328 (ANA 328)

Qualification	Undergraduate
Module credits	8.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 315#, ANA 316#
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Introduction to research. Development of research project. Research skills. Completion of literature review.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Human anatomy Part 2 347 (ANA 347)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Medical Sciences BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	ANA 247 GS
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Anatomy
Period of presentation	Semester 2

Module content

Regional approach to human anatomy.
Cadaver dissection of the head, neck as well as neuro-anatomy. Anatomical techniques.
NOTE: This module is not open to all students and may only be taken by BSc: Medical Sciences students.

Crop physiology 461 (APS 461)

Qualification	Undergraduate
Module credits	15.00

Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250 and BOT 356
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

An overview of photosynthesis and respiration, with the aim of examining the physiological basis of yield in cropping systems. This includes an assessment of parameters for determining plant growth, factors governing yield, partitioning of photoassimilates within plants and opportunities for increasing yield. Crop growth and yield will be put into context of a changing global climate. Evaluation of the manner in which plants respond to various abiotic stresses and how plants sense changing environments. The various roles of plant growth regulators in plants and the importance of these compounds in agriculture.

Crop physiology 761 (APS 761)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	Fortnightly practicals, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

An overview of photosynthesis and respiration, with the aim of examining the physiological basis of yield in cropping systems. this includes an assessment of parameters for determining plant growth, factors governing yield, partitioning of photoassimilates within plants and opportunities for increasing yield. Crop growth and yield will be put into context of a changing global climate. Evaluation of the manner in which plants respond to various abiotic stresses and how plants sense changing environments. The various roles of plant growth regulators in plants and the importance of these compounds in agriculture.

Livestock breeding 325 (APZ 325)

Qualification	Undergraduate
Module credits	10.00
Prerequisites	GTS 261
Contact time	2 lectures per week

Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Introduction to applied animal breeding and genetics: Genetic defects in farm and companion animals (single gene and multifactor characteristics). Phenotypic expression of genes in qualitative and quantitative inheritance. Principles of breeding and selecting farm and companion animals, breeding systems, application and interpretation of breeding values and animal recording schemes.

Dissertation: Animal Production Management 802 (APZ 802)

Qualification	Postgraduate
Module credits	180.00
Programmes	MAgric Animal Production Management MAgric Animal Production Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Thesis: Animal production 990 (APZ 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Animal Production Management PhD Animal Production Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Air Quality Management 810 (AQM 810)

Qualification	Postgraduate
Module credits	80.00
Prerequisites	No prerequisites.
Contact time	1 seminar per week, 2 lectures per week, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

Meteorology: Physical laws of atmospheric flow, turbulence, fine resolution flow modelling. Atmospheric chemistry: persistent organic pollutants, aerosols, airborne particles, dispersion modelling of trace gases, measurement techniques, quality control in measurements. Toxicology and physiology of air quality, Air pollution control technology. Inspection of industrial plants.

Boundary layer meteorology 811 (AQM 811)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Air Quality Management (Coursework) MSc Air Quality Management (Coursework)
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

Introduction to global circulation and South African weather and climate. Mathematical functions and atmospheric balance laws. Stability and mixing heights. The atmospheric boundary layer over urban and rural areas. Turbulence. Earth’s energy budget. Transfer and exchange of energy. Introduction to atmospheric and chemical dispersion modelling. Practical modelling of air pollution: Box models, Gausian puff or plume models, stochastic models, trajectory models.

Atmospheric chemistry 812 (AQM 812)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Air Quality Management (Coursework) MSc Air Quality Management (Coursework)
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The history of atmospheric pollution. Cycles of matter and atmospheric transformations. Gaseous inorganic pollutants. Gas phase organic pollutants. Particulates. The chemistry of atmospheric environmental problems, including acid rain; global warming; ozone depletion; persistant organic pollutants; and photochemical smog. Atmospheric monitoring: sampling methods; sampling strategies; and analytical techniques.

Atmospheric thermodynamics 813 (AQM 813)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Air Quality Management (Coursework) MSc Air Quality Management (Coursework)
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

Gas laws. Virtual temperature. The hydrostatic and hypsometric equations. Dry adiabatic processes. The first law of thermodynamics. Latent heat. Stabilities and instabilities. Dry adiabatic temperature lapse rate. Potential temperature. Inversion layers. Atmospheric moisture and saturated-adiabatic processes. Vapour pressure. Saturation and condensation. Dew and frost point. Relative humidity. Saturated adiabatic temperature lapse rate. Cloud and rain formation. The second law of thermodynamics

Air pollution: society and environment 814 (AQM 814)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Air Quality Management (Coursework) MSc Air Quality Management (Coursework)
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

International air quality criteria and standards. Ambient air quality and meteorological monitoring. Domestic pollution. Household fuel burning. Vehicle emissions. Toxicology and physiology. Industrial pollution. Emissions inventory and report sources. Air pollution and biomass. Air pollution control. Identification of alert air quality thresholds and associate information reporting, investigation and mitigation requirements. Renewable energy. Air pollution and climate. Practical experience.

Agriculture and rural development studies 480 (ARD 480)

Qualification	Undergraduate
Module credits	32.00

Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Overview of the concepts and theories of rural development; the role of agriculture in rural development. Rural livelihood systems: household farming systems; decisions and the operation of farming systems; non-farm enterprises and SMMEs in the rural economy; household food security. Rural institutions: definitions and role of institutions; land tenure; rural financial markets; local institutional development; human capital, knowledge systems. Methodologies for rural development: the farming systems approach; participatory techniques; assessment of land use patterns (zoning techniques); typology techniques; technology transfer and decision-making support; communication for rural development; planning rural development at local level.

Research project: Rural development studies 780 (ARD 780)

Qualification	Postgraduate
Module credits	30.00
Programmes	BAgricHons Rural Development BAgricHons Extension BAgricHons Rural Development
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

Overview of the concepts and theories of rural development including evolution of rural development theories, role of agriculture in rural developments, natural resource base and role of government. Rural livelihood systems focusing on household farming systems, decisions and operation of farming systems, the farm as a social system, nonfarm, off-farm small, micro and medium enterprises in the rural economy, development intervention and household food security. Rural institutions including local governance, community based and farmer organisations, agricultural credit and rural finance, input and output markets, human capital formation, land tenure and land reform, policy making institutions, and institutions of the agricultural knowledge triangle (research, teaching and extension). The relationship between rural sociology, community development and extension; physical and social structures of communities; cultural relativism; sustainability; indigenous knowledge; social stratification; development as change; principles and functions of community development; development barriers; participatory development methodologies, rural poverty. Methodologies for rural development including farming systems approach, participatory appraisal techniques, assessment of land-use patterns and agrarian systems in rural settings: zoning techniques, socio-economic and technical assessment of the farming system, topological techniques and gender sensitive methodologies. Communication for rural development and planning rural development at local levels. Practical assignment in collaboration with rural communities managed by the School's outreach department.

Research project 784 (ARD 784)

Qualification	Postgraduate
Module credits	30.00
Programmes	BAgricHons Rural Development BAgricHons Rural Development
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Research project and case study of rural problems, challenges and dynamics in rural communities. The research project should address an important contemporary rural development problem or challenge and contribute towards the solution thereof.

Mini-dissertation: Rural development 891 (ARD 891)

Qualification	Postgraduate
Module credits	105.00
Programmes	MAgric Rural Development MAgric Rural Development
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo

Period of presentation	Year

Thesis: Rural development 990 (ARD 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Rural Development PhD Rural Development
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Dissertation: Meteorology 890 (AWM 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Meteorology MSc Meteorology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Thesis: Meteorology 990 (AWM 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Meteorology PhD Meteorology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Industrial analysis 780 (BAN 780)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering

Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Not for Industrial Engineering students
Contact time	24 contact hours per semester
Language of tuition	Module is presented in English
Department	Industrial and Systems Engineering
Period of presentation	Semester 1 or Semester 2

Module content

- Monte Carlo Simulation
- Continuous Simulation
- System Dynamics
- Multi-objective Decision-making
- Operations Research
- Decision Analysis
- Discrete Simulation

Introduction to proteins and enzymes 251 (BCM 251)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Health Sciences
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English

Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Structural and ionic properties of amino acids. Peptides, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Interactions that stabilise protein structure, denaturation and renaturation of proteins. Introduction to methods for the purification of proteins, amino acid composition, and sequence determinations. Enzyme kinetics and enzyme inhibition. Allosteric enzymes, regulation of enzyme activity, active centres and mechanisms of enzyme catalysis. Examples of industrial applications of enzymes and in clinical pathology as biomarkers of diseases. Introduction to practical laboratory techniques and Good Laboratory Practice. Techniques for the quantitative and qualitative analysis of biological molecules, enzyme activity measurements . Processing and presentation of scientific data.

Carbohydrate metabolism 252 (BCM 252)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science
Service modules	Faculty of Education Faculty of Health Sciences
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Carbohydrate structure and function. Blood glucose measurement in the diagnosis and treatment of diabetes. Bioenergetics and biochemical reaction types. Glycolysis, gluconeogenesis, glycogen metabolism, pentose phosphate pathway, citric acid cycle and electron transport. Total ATP yield from the complete oxidation of glucose. A comparison of cellular respiration and photosynthesis. Practical techniques for the study and analysis of metabolic pathways and enzymes. PO ratio of mitochondria, electrophoresis, extraction, solubility and gel permeation techniques. Scientific method and design.

Lipid and nitrogen metabolism 261 (BCM 261)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science
Service modules	Faculty of Health Sciences
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Biochemistry of lipids, membrane structure, anabolism and catabolism of lipids. Total ATP yield from the complete catabolism of lipids. Nitrogen metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neurotransmitters, pigments, hormones and nucleotides from amino acids. Catabolism of pureness and pyrimidines. Therapeutic agents directed against nucleotide metabolism. Examples of inborn errors of metabolism of nitrogen containing compounds. The urea cycle, nitrogen excretion. Practical training in scientific reading skills: evaluation of a scientific report. Techniques for separation analysis and visualisation of biological molecules. Hypothesis design and testing, method design and scientific controls.

Biochemical principles of nutrition and toxicology 262 (BCM 262)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science
Service modules	Faculty of Health Sciences
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Biochemistry of nutrition and toxicology. Proximate analysis of nutrients. Review of energy requirements and expenditure, starvation, marasmus and kwashiorkor. Respiratory quotient. Requirements and function of water, vitamins and minerals. Interpretation and modification of RDA values for specific diets, eg growth, exercise, pregnancy and lactation, aging and starvation. Interactions between nutrients. Cholesterol, polyunsaturated, essential fatty acids and dietary anti-oxidants. Oxidation of fats. Biochemical mechanisms of water- and fat-soluble vitamins and assessment of vitamin status. Mineral requirements, biochemical mechanisms, imbalances and diarrhoea. Biochemistry of xenobiotics: absorption, distribution, metabolism and excretion (ADME); detoxification reactions: oxidation/reduction (Phase I), conjugations (Phase II), export from cells (Phase III); factors affecting metabolism and disposition. Examples of genetic abnormalities, phenotypes and frequencies. Examples of toxins: biochemical mechanisms of common toxins and their antidotes. Natural toxins from fungi, plants and animals: goitrogens, cyanogens, cholineesterase inhibitors, ergotoxin, aflatoxins Practical training in scientific writing skills: evaluating scientific findings. Introduction to practical techniques in nutrition and toxicology. Experimental design and calculations in experiments: determining nutritional value of metabolites and studying the ADME of toxins.

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology
Prerequisites	BCM 251 or permission from HOD
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Structure, function, bioinformatics and biochemical analyses of nucleotides, oligonucleotides, amino acids, proteins and ligands and their organisation into hierarchial, higher order structures and interdependent systems. Principles of structure-function relationships. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications. Principles of molecular recognition in protein-ligand, protein-protein, protein-DNA, protein-RNA, DNA-DNA, DNA-ligand, DNA-RNA and RNA-RNA interactions. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Population-specific mutations in disease. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance spectroscopy, mass spectrometry and X-ray crystallography. Protein purification and characterization including, pI, molecular mass, amino acid composition and sequence. Mechanistic aspects and regulation of information flow from DNA via RNA to proteins and back. Lectures incorporate the latest insights into the central dogma of biochemistry and viral polymerases which reverse the information flow ensuring students are prepared for a competitive job market. Practical training include hands-on practical sessions for nucleic acid purification, sequencing and structure characterisation, protein production purification (including SDS-PAGE) and sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).

Biocatalysis and integration of metabolism 357 (BCM 357)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology
Prerequisites	BCM 251 and BCM 252 and BCM 261 or permission from the HOD
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Enzyme nomenclature and classification. Specificity and mechanisms: the active site, mechanisms of catalysis and examples of specific enzyme mechanisms, e.g. lysozyme and carboxypeptidase A. Advanced enzyme kinetics, Cleland nomenclature and multi-substrate reactions. Allosteric enzymes: models by Koshland, Hill and Monod. Ligands binding to proteins. Inhibitors of angiotensin converting enzyme (ACE). RNA as enzymes. Applications of enzymes in food and cosmetics industries and in clinical pathology assays as biomarkers of diseases and toxic responses. Elucidation of metabolic pathways. Antibiotic resistance mechanisms and development of new drugs. Hormonal regulation and integration of mammalian metabolism. Regulation of fuel metabolism after a meal, period between meals and starvation. Metabolic adaptions during diabetes. Obesity and the regulation of body mass. Obesity, matabolic syndrom and Type 2 diabetes (T2D). Management of T2D with diet, exercise and medication. Practical sessions cover tutorials on calculations, isolation of an enzyme, determination of pH and temperature optimum, determination of Km and Vmax, enzyme activation and enzyme inhibition. Computer simulations of drug design and protein docking to improve efficacy and lower toxicity.

Cell structure and function 367 (BCM 367)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology
Prerequisites	BCM 251 and BCM 261 or permission from the HOD

Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Visualising cell structure and localising proteins within cells. Cell ultrastructure. Purification of subcellular organelles. Culturing of cells. Biomembrane structure. Transmembrane transport of ions and small molecules and the role of these processes in disease. Moving proteins into membranes and organelles. Vesicular traffic, secretion, exocytosis and endocytosis. Cell organisation and movement motility based on the three types of cytoskeletal structures including microfilaments, microtubules and intermediate filaments as well as their associated motor proteins. Cell-cell and cell-matrix adhesion through corresponding proteins and morphological structures. Practical training includes tutorials on cytometry and mircoscopy, mini-research projects where students are introduced and guided through aspects of research methodology, experimental planning techniques associated with cellular assays, buffer preparation, active transport studies in yeast cells, structure-function analyses of actin and binding partners.

Molecular basis of disease 368 (BCM 368)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology
Prerequisites	BCM 251 and BCM 252 and BCM 261 or permission from the HOD.
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Molecular mechanisms behind exogenous and endogenous diseases. Foundational knowledge of the immune system, with innate-, adaptive- and auto-immunity (molecular mechanisms of the maintenance and failure of the recognition of foreign in the context of self in the mammalian body) being some of the key concepts. Molecular pathology and immunobiochemistry of exogenous diseases against viral, bacterial and parasitic pathogens with a focus on the human immunodeficiency virus (HIV), tuberculosis (TB) and malaria. Endogenous disease will describe the biochemistry of normal cell cycle proliferation, quiescence, senescence, differentiation and apoptosis, and abnormal events as illustrated by cancer. Tutorials will focus on immunoassays, vaccines, diagnostic tests for diseases and drug discovery towards therapeuticals.

Trends in biochemical research 771 (BCM 771)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Biochemistry BScHons Biochemistry
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Study and discussion of topical research results from recent scientific publications.

Research project and report 773 (BCM 773)

Qualification	Postgraduate
Module credits	60.00
Programmes	BScHons Biotechnology BScHons Biochemistry BScHons Biotechnology
Prerequisites	No prerequisites.
Contact time	1 other contact session per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Research methods 774 (BCM 774)

Qualification	Postgraduate
Module credits	30.00

Programmes	BScHons Biotechnology BScHons Biochemistry BScHons Biotechnology
Prerequisites	Admission into BSc Hons Biochemistry, Biotechnology, Genetics, Microbiology, Bioinformatics or Human Physiology
Contact time	2 web-based periods per week, 4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Students are guided through the methodology of research planning and data handling, as well as science communication skills. They are offered hands-on experience in a range of advanced techniques employed in biochemistry, molecular technologies and biochemical analysis. Scientific writing and presentation skills required for research in biochemistry, are also addressed. Ethical and philosophical issues in the broader field of the Cellular and Molecular Sciences are also addressed. Several of these aspects will be presented collaboratively by the Department of Genetics and the Department of Microbiology and Plant Pathology.

Advanced biochemistry 775 (BCM 775)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Biochemistry BScHons Biochemistry
Prerequisites	Admission into BSc Hons Biochemistry, Genetics, Microbiology, Bioinformatics or Human Physiology
Contact time	4 lectures per week, 4 web-based periods per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

The latest trends towards a biological systems approach of metabolism, functional genomics and control. This includes integration of metabolic pathways, mechanisms of regulation and metabolic control analysis.

Biochemistry: Dissertation 890 (BCM 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Biotechnology MSc Biochemistry MSc Biotechnology
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Project and thesis 990 (BCM 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Biotechnology PhD Biochemistry PhD Biotechnology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Industrial and organisational psychology 181 (BDO 181)

Qualification	Undergraduate
Module credits	5.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Human Resource Management
Period of presentation	Quarter 2

Module content

Capita selecta
This module will provide an introduction to personnel psychology, organisational behaviour and labour relations. It will refer to the selection of employees and the training and development of human resources in order to adapt to changing circumstances. The role of leadership in group utilisation and motivation will be treated both theoretically and practically. Labour relations will be studied in terms of institutional processes and the service relationship and will include practical aspects such as the handling of grievances, disciplining and dispute resolution.

Marketing Management 120 (BEM 120)

Qualification	Undergraduate
Module credits	10.00

Programmes	BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Engineering, Built Environment and Information Technology
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Marketing Management
Period of presentation	Semester 2

Module content

This module provides an overview of the fundamentals of marketing by considering the exchange process, customer value, marketing research and the development of a marketing plan. It also addresses the marketing mix elements with specific focus on the seven service marketing elements namely the service product, physical evidence, people, process, distribution, pricing and integrated marketing communication.

Consumer behaviour 212 (BEM 212)

Qualification	Undergraduate
Module credits	16.00
Programmes	BA Visual Studies BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	BEM 120 GS
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Marketing Management
Period of presentation	Semester 1

Module content

Internal and external influencing factors of consumer behaviour, the consumer's decision process and application fields of consumer behaviour, consumerisms and social responsibility, buying behaviour of consumers in both product and service related industries, consumer psychology and the influence thereof on buying behaviour, psychology of pricing, influencing factors in consumer buying behaviour, the impact of various forms of marketing communication on buying behaviour.

Integrated brand communications 224 (BEM 224)

Qualification	Undergraduate

Module credits	16.00
Programmes	BA Visual Studies BConSci Clothing Retail Management BConSci Food Retail Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	BEM 120 GS
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Marketing Management
Period of presentation	Semester 2

Module content

Integrated brand communications approach, marketing communication planning, objectives and budgets for integrated marketing communications, principles and strategising of marketing communication elements, new media, the brand name communication process, marketing metrics and evaluation for marketing communication effectiveness.

Marketing research 314 (BEM 314)

Qualification	Undergraduate
Module credits	20.00
Programmes	BA Visual Studies BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management
Service modules	Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	BEM 120 and STK 110 GS
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Marketing Management
Period of presentation	Semester 1

Module content

The role of marketing research, the process of marketing research, interpretation of secondary research, qualitative research, survey research, observation, measurement and attitude scaling, questionnaire design, sampling design and sampling procedures, basic data analysis, descriptive statistical analysis, interpretation and reporting of results, research report writing.

Marketing management 321 (BEM 321)

Qualification	Undergraduate
Module credits	20.00
Programmes	BA Visual Studies BConSci Clothing Retail Management BConSci Food Retail Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	BEM 120
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Marketing Management
Period of presentation	Semester 2

Module content

Strategic issues in marketing, strategic marketing, strategic analysis (market analysis, customer analysis, competitor analysis and internal analysis), market strategies (competitive strategies, strategies in the product life cycle and relationship building strategies) and strategy implementation and control.

Business law 210 (BER 210)

Qualification	Undergraduate
Module credits	16.00
Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Geoinformatics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 discussion class per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mercantile Law
Period of presentation	Semester 1

Module content

Basic principles of law of contract. Law of sales, credit agreements, lease.

Business law 220 (BER 220)

Qualification	Undergraduate
Module credits	16.00
Programmes	BConSci Food Retail Management BConSci Clothing Retail Management BConSci Food Retail Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	Examination entrance for BER 210
Contact time	2 lectures per week, 1 discussion class per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mercantile Law
Period of presentation	Semester 2

Module content

Labour law. Aspects of security law. Law of insolvency. Entrepreneurial law; company law, law concerning close corporations. Law of partnerships.

Bioinformatics theory and applications 701 (BIF 701)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Bioinformatics BScHons Bioinformatics
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

General concepts in bioinformatics; sequence motifs and features; sequence databases; common bioinformatics tools; programming in Python; the bioinformatics toolkit for Python; pairwise and multiple sequence alignments; genome analysis; data visualisation; specialised statistics for bioinformatics; specialised algorithms for bioinformatics; nucleic acid modelling; transcription analysis; microarray data analysis; genome annotation; phylogenetics; mapping and markers; structural modelling.

Trends in bioinformatics and literature seminar 702 (BIF 702)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Bioinformatics BScHons Bioinformatics
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Study and discussion of topical research results from recent scientific publications.

Research project and report 703 (BIF 703)

Qualification	Postgraduate
Module credits	60.00
Programmes	BScHons Bioinformatics BScHons Bioinformatics
Prerequisites	No prerequisites.
Contact time	1 other contact session per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Introduction to molecular biology for bioinformatics 704 (BIF 704)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Bioinformatics BScHons Bioinformatics
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Atoms and molecules; the chemistry of life, organisation of the cell; energy; chromosomes; heredity; DNA; RNA and protein synthesis; gene regulation; genetic engineering; genomes; genes and development; evolution; speciation; diversity.

Bioinformatics: Dissertation 803 (BIF 803)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Bioinformatics MSc Bioinformatics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Thesis: Bioinformatics 990 (BIF 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Bioinformatics PhD Bioinformatics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

General microbiology 260 (BLG 260)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Microbiology and Plant Pathology
Period of presentation	Semester 2

Module content

General anatomy and morphology of bacteria, viruses and fungi. Basic nutritional requirements of micro-organisms and the effect of environmental factors on microbial growth. Micro-organisms as essential components of ecospheres: plant, water and soil ecosystems. Food decay, food poisoning and preservation of food by micro-organisms. Basic principles involved in disinfections, sterilization and control of microbes; techniques for microbial repression: sterilization by using heat, radiation, filtration, chemicals; decimation of numbers.

Biometry 120 (BME 120)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Chemistry BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Physical Sciences BSc Food Science BSc Genetics BSc Geography BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
Prerequisites	At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and twoway designs, randomised blocks. Multiple statistical analysis: Bivariate data sets: Curve fitting (linear and non-linear), growth curves. Statistical inference in the simple regression case. Categorical analysis: Testing goodness of fit and contingency tables. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.

Biometry 210 (BME 210)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Biotechnology BSc Biotechnology BSc Nutrition BScAgric Animal Science
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BME 120
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Analysis of variance: Multi-way classification. Testing of model assumptions, graphics. Multiple comparisons. Fixed, stochastic and mixed effect models. Block experiments. Estimation of effects. Experimental design: Principles of experimental design. Factorial experiments: Confounding, single degree of freedom approach, hierarchical classification. Balanced and unbalanced designs. Split-plot designs. Analysis of covariance. Computer literacy: Writing and interpretation of computer programmes. Report writing.

Statistics for biological sciences 780 (BME 780)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Meteorology BScHons Bioinformatics BScHons Entomology BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Medicinal Plant Science BScHons Meteorology BScHons Plant Science BScHons Wildlife Management BScHons Zoology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 Block weeks
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

The principles of experimental design as required for the selection of an appropriate research design. Identification of the design limitations and the impact thereof on the research hypotheses and the statistical methods. Identification and application of the appropriate statistical methods needed. Interpreting of statistical results and translating these results to the biological context.

Plant biology 161 (BOT 161)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Physics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	MLB 111 GS
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Basic plant structure and function; introductory plant taxonomy and plant systematics; principles of plant molecular biology and biotechnology; adaptation of plants to stress; medicinal compounds from plants; basic principles of plant ecology and their application in natural resource management.

South African flora and vegetation 251 (BOT 251)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Environmental Sciences BSc Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology BScAgric Applied Plant and Soil Sciences
Service modules	Faculty of Education
Prerequisites	BOT 161 or permission from head of department
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Origin and affinity of South African flora and vegetation types; principles of plant geography; plant diversity in southern Africa; characteristics, environments and vegetation of South African biomes and associated key ecological processes; centra of plant endemism; rare and threatened plant species; biodiversity conservation and ecosystem management; invasion biology; conservation status of South African vegetation types.

Plant physiology and biotechnology 261 (BOT 261)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Environmental Sciences BSc Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education

Prerequisites	BOT 161, CMY 117, CMY 127 or permission from head of department
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Nitrogen metabolism in plants; nitrogen fixation in Agriculture; plant secondary metabolism and natural products; photosynthesis and carbohydrate metabolism in plants; applications in solar energy; plant growth regulation and the Green Revolution; plant responses to the environment; developing drought tolerant and disease resistant plants.

Plant ecophysiology 356 (BOT 356)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Microbiology BSc Biochemistry BSc Biotechnology BSc Ecology BSc Genetics BSc Microbiology BSc Plant Science BSc Zoology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education
Prerequisites	BOT 161 or permission from head of department
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The emphasis is on the efficiency of the mechanisms whereby C3-, C4 and CAM-plants bind CO2 and how it impacted upon by environmental factors. The mechanisms and factors which determine the respiratory conversion of carbon skeletons and how production is affected thereby will be discussed. Insight into the ecological distribution and manipulation of plants for increased production is gained by discussing the internal mechanisms whereby carbon allocation, hormone production, growth, flowering and fruitset are influenced by external factors. To understand the functioning of plants in diverse environments, the relevant structural properties of plants, and the impact of soil composition, water flow in the soil-plant air continuum and long distance transport of assimilates will be discussed. Various important techniques will be used in the practicals to investigate aspects such as water-use efficiency, photosynthesis and respiration of plants.

Plant ecology 358 (BOT 358)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Microbiology BSc Biochemistry BSc Biotechnology BSc Ecology BSc Environmental Sciences BSc Genetics BSc Microbiology BSc Plant Science BSc Zoology
Prerequisites	BOT 161 and BOT 251 or permission from head of department
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Theory of plant community concepts, floristic and structural composition, plant diversity, ecological succession, landscape ecology. Data processing techniques. Species interactions and an evaluation of their effects on interacting species. Fundamentals of plant population biology: life tables; plant breeding systems and pollination; population dynamics; life history strategies; intraspecific competition; interspecific competition and co-existence.

Phytomedicine 365 (BOT 365)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Microbiology BSc Plant Science BSc Zoology
Service modules	Faculty of Education
Prerequisites	BOT 161 or permission from head of department
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences

Period of presentation Semester 2

Module content

The module will include a review on the discovery and use of plant medicines and phyto-therapeutically important molecules obtained from plants. Certain aspects of natural product chemistry i.e. the biosynthesis, ecological role and toxicity of the three main classes of secondary compounds; terpenoids, phenolics, and alkaloids are discussed. An introduction to the principles and applications of metabolomics is presented. The role of these natural products in defense against microorganisms and herbivores is reviewed during the module. The importance of ethnobotany and phylogenetics in modern drug discovery from biodiversity will presented along with legal and ethical considerations surrounding bioprospecting. This will follow on with modern theories and practices regarding sustainable utilisation and conservation of medicinal plants. The basics of alternative medicines, with an emphasis on traditional African and Chinese medicines, are also discussed as well as current evidence-based research and product development derived from these. Biotechnological approaches to medicinal natural product production, 'farmer to pharma', will be covered, including plant cell culture and bioreactors. Practical sessions on drug discovery approaches using chromatographic techniques for phytochemical analysis of secondary metabolites such as tannins, alkaloids, and saponins are conducted. Bioassays on micro-organisms are also done during the practical sessions in order to develop the skills for the potential discovery of new antibiotics.

Plant diversity 366 (BOT 366)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Biotechnology BSc Biochemistry BSc Biotechnology BSc Ecology BSc Environmental Sciences BSc Genetics BSc Plant Science BSc Zoology
Service modules	Faculty of Education
Prerequisites	BOT 161 or permission from head of department
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Basic principles and methods of plant classification. Sources of plant variation. Modern methods to ascertain evolutionary relationships among plants. The extent and significance of vascular plant diversity. General structural and biological characteristics of evolutionary and ecologically important plant groups. Botanical nomenclature. Plant identification in practice; identification methods, keys, herbaria and botanical gardens. Diagnostic characters for the field identification of trees, wild flowers and grasses. Family recognition of southern African plants. Available literature for plant identification. Methods to conduct floristic surveys. Nature and significance of voucher specimens.

Natural woodland and forests: Ecology and management 700 (BOT 700)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Meteorology BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology BScHons Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Definitions of woodlands and forests and vegetation and forest resources in southern Africa; Classification of forest and woodland in southern Africa; Woodland dynamics including disturbance, recruitment, growth and mortality, recovery after disturbance; Ecosystem services (microclimate and nutrient cycling, carbon sequestration etc); Sustainable forest resource management (resource assessment, socio-economic assessment e.g. wood and non-forest products, participatory resource management processes); Forest health; Monitoring of resource-use impacts and adaptive management; Development of a framework for sustainable conservation and use of non-timber forest products; Climate change and resilience. Forest disease and pathology.

Molecular techniques 705 (BOT 705)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Plant Science BScHons Biotechnology BScHons Plant Science
Prerequisites	Admission into BSc Hons in Plant Science (Plant Biotechnology/Physiology)
Contact time	1 discussion class per week, 1 lecture per week, 5 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences

Period of presentation	Semester 1

Module content

Students are guided through the methodology of research planning and data handling. They are offered hands-on experience in a range of advanced techniques employed in molecular research and analysis.

Plant nomenclature 712 (BOT 712)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The regulations of the International Code for Botanical Nomenclature. Principles of nomenclature. History of plant collecting. Type specimens.

Seed ecology 714 (BOT 714)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Regeneration of plants from seed under natural conditions. Early stages in the life of a plant from ovule to established seedling: seed production; seed predation; seed dispersal; seed germination and dormancy, seed bank dynamics and seedling establishment.

Plant morphology 717 (BOT 717)

Qualification	Postgraduate

Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Speciation in flowering plants; plant variation. Sex determination in flowering plants. Reproductive systems in flowering plants.

Introduction to plant biotechnology 718 (BOT 718)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Plant genome: structure and composition of the plant genome (nuclear, mitochondrial and chloroplast); applications in plant biotechnology: plant tissue culture (microproagation, somatic embryogenesis and cell suspension cultures). Genetic manipulation and gene transfer technology (Agrobacterium-based and other) and DNA-marker technology.

Primary plant metabolism 719 (BOT 719)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 web-based period per week, 1 practical per week, 1 discussion class per week

Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Regulation and interaction of primary plant metabolic pathways on the sub-cellular and whole plant level.

Plant ecology 730 (BOT 730)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	8 hours per day for 5 days
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Practical applications of plant ecology principles. Designing and executing field studies. Exposure to skills of field ecology and plant identification. This module includes a compulsory 5-day field component.

Plant taxonomy 741 (BOT 741)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Classification, identification and nomenclature, methodology of a revision study, analysis and presentation of taxonomic information, evolution, phylogeny and cladistics.

Plant classification and phytogeography 742 (BOT 742)

Qualification	Postgraduate

Module credits	20.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	BOT 366
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

An overview of phylogenetics sets the scene, and sources of taxonomic information (morphology, anatomy, chemotaxonomy, cytogenetics, reproductive biology, palynology, ethnobotany and paleobotany) and how these data are used are discussed. This is followed by a section on the use of phylogenies as tools to understand ecological and geographical patterns and processes. Modern plant distribution patterns are assessed from the framework of the competing explanations of dispersalisn and vicariance.

Applications in plant biotechnology 746 (BOT 746)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Creation of genetically modified plants and their impact on modern agriculture.

Phytopharmacology 748 (BOT 748)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Medicinal Plant Science BScHons Medicinal Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 discussion class per week

Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Pharmacological action of low molecular plant constituents and high molecular weight compounds. Plant constituents as anticancer, antibacterial, antiviral, hypoglycaemic, freeradical scavengers, hypotensive and as anti-inflammatory agents. Cell culturing, cell growth and apoptosis, cell mediated immune responses. Drug development in TB as models for research. Enzymes, receptors and plant constituents. The unique challenges of plant-based medicines.

Pharmacognosy/Phytotherapy 749 (BOT 749)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Medicinal Plant Science BScHons Medicinal Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Basic concepts of toxicology. Systemic, developmental, genetic and organ-specific toxic effects. Hallucinogenic, allergenic, teratogenic and other toxic plants. Plant constituents, contradictions and interactions. Phytotoxicity unrelated to plant constituents. Safety and efficacy issues of commonly used Phyto-drugs with emphasis on pharmaceutical applications. Practical aspects related to the manufacture of good quality plant-based medicines. Phyto-drug formulation, standardisation and aspects concerning different dosage forms.

Advanced phytomedicine 761 (BOT 761)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Metabolism and functions of secondary compounds such as tannins, alkaloids, terpenoids, flavonoids and free amino acids. Importance of secondary compounds in the defence mechanisms of plants. Isolation and identification of medicinal bioactive compounds from plants. Their current scope and potential applications in ethnobotany. Strategies to discover new pharmaceuticals from ethnomedicine.

Research report 782 (BOT 782)

Qualification	Postgraduate
Module credits	60.00
Programmes	BScHons Biotechnology BScHons Biotechnology BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Teaching and planning, execution and documentation of a research project.

Seminar 783 (BOT 783)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Literature study, discussion and oral presentation of a subject related to the main discipline.

Trends in plant science 784 (BOT 784)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Literature study of recent publications in a subject related to one of the elective disciplines.

Practical plant identification 786 (BOT 786)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science BScHons Wildlife Management
Prerequisites	BSc with first year Botany/Plant Science
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Principles of identification, classification and nomenclature; identification of plants; family recognition; collection of plant specimens for identification; herbarium as a source of information. Variation in seed plants and breeding systems. Practical work involves an excursion.

Spatial analysis in ecology 788 (BOT 788)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Plant Science BScHons Medicinal Plant Science BScHons Plant Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Mapping and analysing spatial data. Theory and basic techniques of analysing and manipulating spatial data using geographical information systems. Mapping of vegetation types, species distributions and diversity, species traits. Understanding the spatial drivers of biodiversity patterns. The influence of scale on biodiversity analyses. Relevance for conservation planning for mapping biodiversity risk and prioritsing conservation, especially in a South African context.

Land reclamation and restoration ecology 791 (BOT 791)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Plant Science BScHons Plant Science
Service modules	Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	Block: 6 weeks per semester,3 discussions per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

This module will provide students with the skills to use biophysical information and data obtained by undertaking a natural resource inventory. This will be supported by taught methods of critically evaluating data and information obtained through assessment methodologies and an understanding of sampling design (choosing reference sites, spatial replication) and monitoring methods (e.g. recording biomass vs vegetation cover vs species richness; aspects of seed biology etc.). Through the additional understanding of ecological and agricultural concepts (e.g. productivity, decomposition rate, carbon uptake, pollinator abundance, erosion protection, dust reduction) students will acquire the skills to provide reclamation and restoration solutions to land degradation challenges in South Africa.
A site visit or field trip during which students will get exposed to the realities of reclamation and restoration and apply their knowledge and skills will be a compulsory component of this module.

Plant systematics 802 (BOT 802)

Qualification	Postgraduate
Module credits	30.00
Prerequisites	No prerequisites.
Contact time	5 discussion classes per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content
Plant variation and evolution; theory and practice of plant classification; concept of categories in the taxonomic hierarchy; sources and handling of taxonomic data; taxonomic collections (herbaria and curating of collections); the process of plant identification; code of nomenclature; taxonomic publication.

Dissertation: Plant science 890 (BOT 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Plant Science MSc Biotechnology MSc Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Thesis: Plant science 990 (BOT 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Biotechnology PhD Biotechnology PhD Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Plant genetics and crop biotechnology 361 (BTC 361)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology

Prerequisites	GTS 251 and {GTS 261 GS or BOT 261}
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Plant genetics and genomics: gene control in plants, epigenetics, co-suppression, forward and reverse genetics, structural and functional genomics. Plant development: flowering, genetics imprinting. Plant-environment interactions. Crop genetic modification: food security, GMO regulation, plant transformation, whole-chromosome transformation, synthetic biology, homologous recombination. Crop molecular markers: marker types, genotyping, QTL mapping, marker-assisted breeding. Future of crop biotechnology: applications of genomics, biopharming, genetical genomics, systems biology

Biotechnology in the workplace 701 (BTW 701)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Plant Science BScHons Biotechnology BScHons Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Introduction to the principles and realities of working in the field of biotechnology. Discussions on various aspects, including entrepreneurship; intellectual property; patent rights; financial management; grant applications and product marketing. The module will be assessed by way of a simulated grant application for the development of a hypothetical biotechnological venture.

Introductory physics 152 (CGS 152)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 discussion classes per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Heat and temp: Thermal interaction; operational definition of temperature; expansion; temperature in the kinetic molecular model; work, energy and heat; phase transitions and mechanisms of heat transfer. Measurements: What is measuring; the scientific method; measuring error; significant figures. Geometric optics: Light travels straight; shadow formation; plane, convex and concave mirrors; refraction and lenses (thin); optical instruments. Practicals related to the topics.

Introductory physics 162 (CGS 162)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	CGS 152
Contact time	2 discussion classes per week, 2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Kinematics: Basic concepts in kinematics in vector notation; different representations to describe motions; instantaneous velocity; acceleration; equations of motion (constant acceleration). Dynamics: Interactions, Newton's third law, Newton's first and second law; gravitation; normal force and friction. Forces in two dimensions: resolving and adding forces. Work energy and power. Electricity: Static and flowing electricity, current, potential difference, power, resistance, simple DC-circuits.
Practicals related to the topics.

General chemistry 171 (CHM 171)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Civil Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 discussion class per week, 1 web-based period per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

General introduction to inorganic, analytical and physical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning chemical reactions, redox reactions, solubilities and solutions, atomic structure, periodicity. Molecular structure and chemical bonding using the VSEPR model. Principles of reactivity, electrochemistry, energy and chemical reactions, entropy and free energy. Appropriate tutorial classes and practicals.

General chemistry 172 (CHM 172)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Electronic Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	1 practical per week, 4 lectures per week, 1 web-based period per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

General introduction to inorganic, analytical and physical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning chemical reactions, redox reactions, solubilities and solutions, atomic structure, periodicity. Molecular structure and chemical bonding using the VSEPR model. Principles of reactivity, electrochemistry, energy and chemical reactions, entropy and free energy. Appropriate tutorial classes and practicals.

General chemistry 181 (CHM 181)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Chemical Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CHM 171
Contact time	1 discussion class per week, 4 lectures per week, 1 practical per week, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

General physical-analytical chemistry: Physical behaviour of gases, liquids and solids, intermolecular forces, solutions, chemical equilibrium, acids and bases, buffers, precipitation. Organic chemistry: Structure (bonding) and functional groups, nomenclature, isomerism, introductory stereo-chemistry, introduction to chemical reactions and chemical properties of organic compounds.
Appropriate tutorial classes and practicals.

Chemistry 215 (CHM 215)

Qualification	Undergraduate
Module credits	12.00
Programmes	BEng Chemical Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CHM 171 or CHM 172 and CHM 181
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Organic chemistry. Chemical properties of organic (including aromatic) compounds. Functional group transformation and synthesis.

Chemistry 226 (CHM 226)

Qualification	Undergraduate
Module credits	8.00
Programmes	BEng Chemical Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CHM 171 or CHM 172 and CHM 181
Contact time	6 ppw, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

Theory: Introduction to instrumental chemical analysis. Integration of electronic, chemical, optical and computer principles for the construction of analytical instrumentation. Detail discussion of principles and some instrumental methods from three disciplines within analytical chemistry, namely electrochemistry, spectroscopy and chromatography. This includes potentiometry, (AA) atomic absorption-, (ICP) atomic emission-, ultraviolet (UV)-, and infrared (IR) spectroscopy, potentiometric and photometric titrations, gas chromatography, liquid chromatography as well as combinations of these techniques. Practical: IR spectroscopy, UV spectroscopy, AA spectroscopy, potentiometric titration, gas chromatography.

Dissertation: Chemistry 890 (CHM 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Science Education MSc Chemistry MSc Science Education
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Year

Thesis: Chemistry 990 (CHM 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Chemistry PhD Chemistry
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Year

General chemistry 117 (CMY 117)

Qualification	Undergraduate
Module credits	16.00

Programmes	BDietetics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Geography BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science
Prerequisites	A candidate must have Mathematics for at least 60% and 60% for Physical Sciences.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

General introduction to inorganic, analytical and physical chemistry. Atomic structure and periodicity. Molecular structure and chemical bonding using the VSEOR model. Nomenclature of inorganic ions and compounds. Classification of reactions: precipitation, acid-base, redox reactions and gas-forming reactions. Mole concept and stoichiometric calculations concerning chemical formulas and chemical reactions. Principles of reactivity: energy and chemical reactions. Physical behaviour gases, liquids, solids and solutions and the role of intermolecular forces. Rate of reactions: Introduction to chemical kinetics.

General chemistry 127 (CMY 127)

Qualification	Undergraduate
Module credits	16.00
Programmes	BDietetics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Physical Sciences BSc Food Science BSc Genetics BSc Geography BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science

Prerequisites	Natural and Agricultural Sciences students: CMY 117 GS or CMY 154 GS Health Sciences students: none
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

Theory: General physical-analytical chemistry: Chemical equilibrium, acids and bases, buffers, solubility equilibrium, entropy and free energy, electrochemistry. Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry, introduction to chemical reactions and chemical properties of organic compounds and biological compounds, i.e. carbohydrates and aminoacids. Practical: Molecular structure (model building), synthesis and properties of simple organic compounds.

Chemistry 133 (CMY 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	As for BSc Extended programme
Contact time	Foundation Course, Fortnightly practicals, 3 discussion classes per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

The field of Chemistry – an overview; Mathematics in Chemistry; atomic theory: historical overview; atoms, molecules and ions; relative atomic mass; electronic structure of atoms; the periodic table; periodicity; chemical bonding.

Chemistry 143 (CMY 143)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	CMY 133
Contact time	Foundation Course, Fortnightly practicals, 3 discussion classes per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Bonding and molecular geometry: VSEPR theory; bonding and organic compounds (structural formulas, classification and nomenclature); matter and its properties; mole concept; reaction stoichiometry; reactions in aqueous solutions: precipitation, acid base and redox.

Chemistry 151 (CMY 151)

Qualification	Undergraduate
Module credits	16.00
Programmes	BPhysio
Service modules	Faculty of Health Sciences Faculty of Veterinary Science
Prerequisites	A candidate must have Mathematics for at least 60% and 60% for Physical Sciences.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Theory: Introduction to general chemistry: Measurement in chemistry, matter and energy, atomic theory and the periodic table, chemical compounds and chemical bonds; quantitative relationships in chemical reactions, states of matter and the kinetic theory; solutions and colloids, acids, bases and ionic compounds, chemical equilibria.
Introduction to organic chemistry: Chemical bonding in organic compounds, nature, physical properties and nomenclature of simple organic molecules, isomerism, chemical properties of alkanes and cycloalkanes, alkenes, alcohols, aldehydes and ketones, carboxylic acids and esters, amines and amides, carbohydrates, proteins, and lipids.
Practicals.

Chemistry 154 (CMY 154)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	CMY 133 and CMY 143
Contact time	fortnightly practicals, 2 tutorials per week, 3 lectures per week, Foundation Course
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Principles of reactivity: energy and chemical reactions. Physical behaviour of gasses, liquids, solids and solutions and the role of intermolecular forces. Rate of reactions: Introduction to Chemical kinetics. Introduction to chemical equilibrium. Introduction to organic chemistry: hybridisation, isomers (structural, geometrical and conformational), additions reactions and reaction mechanisms.

Physical chemistry 282 (CMY 282)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Genetics BSc Geography BSc Geology BSc Human Physiology BSc Mathematics BSc Microbiology BSc Physics BSc Plant Science
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	4 lectures per week, 2 practicals per week, 1 tutorial per week
Language of tuition	Module is presented in English

Department	Chemistry
Period of presentation	Quarter 2

Module content

Theory: Classical chemical thermodynamics, gases, first and second law and applications, physical changes of pure materials and simple compounds. Phase rule: Chemical reactions, chemical kinetics, rates of reactions.

Analytical chemistry 283 (CMY 283)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Genetics BSc Geography BSc Geology BSc Human Physiology BSc Mathematics BSc Microbiology BSc Physics BSc Plant Science
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals per week, 4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 3

Module content

Theory: Statistical evaluation of data, gravimetric analysis, aqueous solution chemistry, chemical equilibrium, precipitation-, neutralisation- and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry.

Organic chemistry 284 (CMY 284)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Genetics BSc Geography BSc Geology BSc Human Physiology BSc Mathematics BSc Microbiology BSc Physics BSc Plant Science
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals per week, 4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 1

Module content

Theory: Resonance, conjugation and aromaticity. Acidity and basicity. Introduction to ^{13}C NMR spectroscopy. Electrophilic addition: alkenes. Nucleophilic substitution, elimination, addition: alkyl halides, alcohols, ethers, epoxides, carbonyl compounds: ketones, aldehydes, carboxylic acids and their derivatives.

Inorganic chemistry 285 (CMY 285)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Genetics BSc Geography BSc Geology BSc Human Physiology BSc Mathematics BSc Physics BSc Plant Science
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127

Contact time	4 lectures per week, 1 tutorial per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 4

Module content

Theory: Atomic structure, structure of solids (ionic model). Coordination chemistry of transition metals: Oxidation states of transition metals, ligands, stereochemistry, crystal field theory, consequences of d-orbital splitting, chemistry of the main group elements, electrochemical properties of transition metals in aqueous solution, industrial applications of transition metals.Fundamentals of spectroscopy and introduction to IR spectroscopy.

Physical chemistry 382 (CMY 382)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Environmental Sciences BSc Geology BSc Human Physiology BSc Mathematics BSc Physics
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	4 lectures per week, 2 practicals per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 4

Module content

Theory: Molecular quantum mechanics. Introduction: Shortcomings of classical physics, dynamics of microscopic systems, quantum mechanical principles, translational, vibrational and rotational movement. Atomic structure and spectra: Atomic hydrogen, multiple electron systems, spectra of complex atoms, molecular structure, the hydrogen molecule ion, diatomic and polyatomic molecules, structure and properties of molecules. Molecules in motion: Viscosity, diffusion, mobility. Surface chemistry: Physisorption and chemisorption, adsorption isotherms, surface tension, heterogeneous catalytic rate reactions, capillarity.

Analytical chemistry 383 (CMY 383)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Environmental Sciences BSc Geology BSc Human Physiology BSc Mathematics BSc Physics
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	2 practicals per week, 1 discussion class per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 1

Module content

Theory: Separation methods: Extraction, multiple extraction, chromatographic systems. Spectroscopy: Construction of instruments, atomic absorption and atomic emission spectrometry, surface analysis techniques. Mass spectrometry. Instrumental electrochemistry.

Organic chemistry 384 (CMY 384)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Environmental Sciences BSc Geology BSc Human Physiology BSc Mathematics BSc Physics
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	2 practicals per week, 1 discussion class per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 3

Module content

Theory: NMR spectroscopy: applications. Aromatic chemistry, Synthetic methodology in organic chemistry. Carbon-carbon bond formation: alkylation at nucleophilic carbon sites, aldol and related condensations, Wittig and related reactions, acylation of carbanions (Claisen condensation).

Inorganic chemistry 385 (CMY 385)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Applied Mathematics BSc Biochemistry BSc Chemistry BSc Environmental Sciences BSc Geology BSc Human Physiology BSc Mathematics BSc Physics
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	4 lectures per week, 2 practicals per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Quarter 2

Module content

Theory: Structure and bonding in inorganic chemistry. Molecular orbital approach, diatomic and polyatomic molecules, three-centre bonds, metal-metal bonds, transition metal complexes, magnetic properties, electronic spectra, reactivity and reaction mechanisms, reaction types, acid-base concepts, non-aqueous solvents, special topics.

Analytical chemistry A 706 (CMY 706)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 discussion class per week for 4 weeks, 6 lectures per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Selected aspects of: Mass spectometry: ion sources, analysers, detectors, isotope ratios, accurate mass, ion fragmentation, tandem mass spectrometry. Chromatography: theory and instrumentation of gas, liquid and supercritical fluid chromatography, multidimensional systems and coupling to mass spectrometry.

Analytical chemistry B 707 (CMY 707)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 discussion class per week for 4 weeks, 6 lectures per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Selected aspects: Electrochemistry: fundamental theory, voltammetry, metal-ligand equilibria, modelling and measurement of solution composition. Statistics: precision and accuracy, random errors, hypothesis testing, method of least squares, curve fitting, multivariate statistics, interpreting patterns of data. Chemical metrology: propagation of errors, quality control of quantitative and qualitative analytical information, international standards, interlaboratory calibration

Organic chemistry A 708 (CMY 708)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	6 lectures per week for 4 weeks, 1 discussion class per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Stereocontrolled organic synthesis: substrate stereocontrol in diastereoselective synthesis. Retrosynthesis: principles and applications. Protecting groups in synthesis. Aromatic and heteroaromatic chemistry.

Organic chemistry B 709 (CMY 709)

Qualification	Postgraduate

Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	6 lectures per week for 4 weeks, 1 discussion class per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Stereocontrolled organic synthesis: chiral auxiliaries in synthesis; reagent controlled synthesis; catalyst controlled synthetic methods. Pericyclic reactions and transition metals in organic synthesis. Aliphatic and heterocyclic amine chemistry.

Inorganic chemistry A 714 (CMY 714)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	6 lectures per week for 4 weeks, 1 discussion class per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Inorganic and organometallic chemistry. Classification of ligands and complexes. Synthesis, structure, bonding and reactivity of complexes. Homogeneous catalysis and template effects.

Inorganic chemistry B 715 (CMY 715)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	6 lectures per week for 4 weeks, 1 discussion class per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry

Period of presentation	Semester 1 or Semester 2

Module content

Main group chemistry. From complexes to clusters to networks. Reaction kinetics and mechanisms. Supramolecular chemistry Bioinorganic and bioorganometallic compounds. Metals in medicine.

Physical chemistry A 716 (CMY 716)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 discussion class per week for 4 weeks, 6 lectures per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Crystallography: theoretical principles, symmetry elements and operations, point groups, space groups, theory of crystals, X-rays, crystallographic techniques, structure determinations, powder diffraction and crystallographic data bases.

Molecular modelling: molecular structure/energy, methodology, principles and and molecular surfaces.

Physical chemistry B 717 (CMY 717)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 practical per week for 7 weeks, 6 lectures per week for 4 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 or Semester 2

Module content

Chemical kinetics: rates of chemical reactions, equilibrium reactions, temperature dependence of reactions, complex reactions, reaction mechanisms and kinetics by thermal analysis. Statistical mechanics: Boltzmann distribution, partition functions, ensembles, thermodynamic functions, equilibria.

Research: Organic/inorganic project Part 1 718 (CMY 718)

Qualification	Postgraduate
Module credits	20.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 seminar per week, 1 practical per week for 7 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 and Semester 2

Module content

Students work on one project during the year which has a significant component that can be described as instrumental or computational or analysis of data or theoretical. A report and a presentation are required.

Research: Physical/analytical project Part 2 719 (CMY 719)

Qualification	Postgraduate
Module credits	20.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	1 practical per week for 7 weeks
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1 and Semester 2

Module content

Students work on one project during the year which has a significant component that can be described as instrumental or computational or analysis of data or theoretical. A report and a presentation are required.

Advanced practical techniques 730 (CMY 730)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Chemistry BScHons Chemistry
Prerequisites	No prerequisites.
Contact time	5 tutorials per week for 6 weeks, 5 lectures per week for 6 weeks
Language of tuition	Module is presented in English

Department	Chemistry
Period of presentation	Year

Module content

Chemical information literacy; Molecular modelling; NMR spectroscopy; Mass spectrometry; Crystallography and Metrology will be presented from a practical point of view with an emphasis on the interpretation of data and use of instrumentation rather than on underlying theory.

Community nutrition 321 (CNT 321)

Qualification	Undergraduate
Module credits	10.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	3rd-year status
Contact time	Community Engagement, 2 lectures per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 2

Module content

Community nutrition practice within the larger public health realm. Nutrition within primary healthcare. Nutrition and community development as well as project planning and management.

Community nutrition 411 (CNT 411)

Qualification	Undergraduate
Module credits	25.00
Programmes	BDietetics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	4th-year status
Contact time	4 lectures per week, 1 discussion class per week, Community Engagement
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 1

Module content

Global nutrition challenges e.g. food security, protein-energy and micronutrient malnutrition, non communicable diseases of lifestyle, etc. Public health approaches and general nutrition interventions to address these challenges. Nutrition program development including assessment, analysis and interventions in the South African context as well as Nutrition Policy formulation

Program design: Introduction 110 (COS 110)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Physics BSc Extended programme - Mathematical Sciences BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	COS 132 , COS 151 and Maths level 5
Contact time	1 tutorial per week, 1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 2

Module content

The focus is on object-oriented (OO) programming. Concepts including inheritance and multiple inheritance, polymorphism, operator overloading, memory management (static and dynamic binding), interfaces, encapsulation, reuse, etc. will be covered in the module. The module teaches sound program design with the emphasis on modular code, leading to well structured, robust and documented programs. A modern OO programming language is used as the vehicle to develop these skills. The module will introduce the student to basic data structures, lists, stacks and queues.

Operating systems 122 (COS 122)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Mathematical Statistics BSc Physics
Prerequisites	COS 132
Contact time	1 tutorial per week, 3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 2

Module content

Fundamental concepts of modern operating systems in terms of their structure and the mechanisms they use are studied in this module. After completing this module, students will have gained, as outcomes, knowledge of real time, multimedia and multiple processor systems, as these will be defined and analysed. In addition, students will have gained knowledge on modern design issues of process management, deadlock and concurrency control, memory management, input/output management, file systems and operating system security. In order to experience a hands-on approach to the knowledge students would have gained from studying the abovementioned concepts, students will have produced a number of practical implementations of these concepts using the Windows and Linux operating systems.

Imperative programming 132 (COS 132)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Mathematical Statistics BSc Mathematical Statistics BSc Physics
Service modules	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	APS of 30 and level 5 (60-69%) Mathematics
Contact time	3 lectures per week, 1 tutorial per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

This module introduces imperative computer programming, which is a fundamental building block of computer science. The process of constructing a program for solving a given problem, of editing it, compiling (both manually and automatically), running and debugging it, is covered from the beginning. The aim is to master the elements of a programming language and be able to put them together in order to construct programs using types, control structures, arrays, functions and libraries. An introduction to object orientation will be given. After completing this module, the student should understand the fundamental elements of a program, the importance of good program design and user-friendly interfaces. Students should be able to conduct basic program analysis and write complete elementary programs.

Introduction to computer science 151 (COS 151)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Mathematical Statistics BSc Mathematical Statistics BSc Physics
Service modules	Faculty of Education Faculty of Natural and Agricultural Sciences

Prerequisites	APS of 30 and level 5 (60-69%) Mathematics.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

This module introduces concepts and terminology related to the computer science discipline. General topics covered include the history of computing, machine level representation of data, Boolean logic and gates, basic computer systems organisation, algorithms and complexity and automata theory. The module also introduces some of the subdisciplines of computer science, such as computer networks, database systems, compilers, information security and intelligent systems. The module also focues on modelling of algorithms.

Theoretical computer science 210 (COS 210)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Physics
Prerequisites	COS 110 and COS 151
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

This module introduces students to a framework for investigating both computability and complexity of problems. Topics include, but are not limited to: finite-state machines, regular expressions and their application in a language such as awk, the Halting problem, context-free grammars, P vs NP problem, NP-complete class, reduction techniques, regular languages, DFAs and NFAs, Lattices, Church-Turing thesis.

Theoretical Computer Science 211 (COS 211)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	COS 110 and COS 151
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

This module introduces students to a framework for investigating both computability and complexity of problems. Topics include, but are not limited to: finite-state machines, regular expressions and their application in a language such as awk, the Halting problem, context-free grammars, P vs NP problem, NP-complete class, reduction techniques, regular languages, DFAs and NFAs, Lattices, context-free grammars, Church-Turing thesis.

Data structures and algorithms 212 (COS 212)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	COS 110
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

Data abstraction is a fundamental concept in the design and implementation of correct and efficient software. In prior modules, students are introduced to the basic data structures of lists, stacks and queues. This module continues with advanced data structures such as trees, hash tables, heaps and graphs, and goes into depth with the algorithms needed to manipulate them efficiently. Classical algorithms for sorting, searching, traversing, packing and game playing are included, with an emphasis on comparative implementations and efficiency. At the end of this module, students will be able to identify and recognise all the classical data structures; implement them in different ways; know how to measure the efficiency of implementations and algorithms; and have further developed their programming skills, especially with recursion and polymorphism.

Concurrent systems 226 (COS 226)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Physics
Prerequisites	COS 122 and COS 212
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 2

Module content

Computer science courses mostly deal with sequential programs. This module looks at the fundamentals of concurrency; what it means, how it can be exploited, and what facilities are available to determine program correctness. Concurrent systems are designed, analysed and implemented.

Computer organisation and architecture 284 (COS 284)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Physics
Prerequisites	COS 212 GS
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 2

Module content

This module provides the foundations on which other modules build by enabling a deeper understanding of how software interacts with hardware. It will teach the design and operation of modern digital computers by studying each of the components that make up a digital computer and the interaction between these components. Specific areas of interest, but not limited to, are: representation of data on the machine-level; organisation of the machine on the assembly level; the architecture and organisation of memory; inter- and intra-component interfacing and communication; data paths and control; and parallelism. Topic-level detail and learning outcomes for each of these areas are given by the first 6 units of ‘Architecture and Organisation’ knowledge area as specified by the ACM/IEEE Computer Science Curriculum 2013.
The concepts presented in the theory lectures will be reinforced during the practical sessions by requiring design and implementation of the concepts in simulators and assembly language using an open source operating system.

Artificial intelligence 314 (COS 314)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics
Prerequisites	COS 110
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

The main objective of this module is to introduce a selection of topics from artificial intelligence (AI), and to provide the student with the background to implement AI techniques for solving complex problems.
This module will cover topics from classical AI, as well as more recent AI paradigms. These topics include: search methods, game playing, knowledge representation and reasoning, machine learning, neural networks, genetic algorithms, artificial life, planning methods, and intelligent agents. In the practical part of this module, students will get experience in implementing
(1) game trees and evolving game-playing agents;
(2) a neural network and applying it to solve a real-world problem; and
(3) a genetic algorithm and applying it to solve a real-world problem.

Computer security and ethics 330 (COS 330)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics
Prerequisites	COS 110
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 2

Module content

This module develops an appreciation of the fundamentals and design principles for information assurance and security. Students will develop a clear understanding of the basic information security services and mechanisms, enabling them to design and evaluate the integration of solutions into the user application environment. Emphasis will be placed on services such as authorisation and confidentiality. Students will acquire knowledge and skills of Security Models such as the Bell-LaPadula, Harrison-Ruzzo Ullman and Chinese Wall Model. Students will develop a detailed understanding of the confidentiality service by focusing on cryptology and the practical implementation thereof. The student will be introduced to professional and philosophical ethics. At the end of the module students will be able to engage in a debate regarding the impact (local and global) of computers on individuals, organisations and society. The professionalism of IT staff will be discussed against national and international codes of practices such as those of the CSSA, ACM and IEEE.

Programming languages 333 (COS 333)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics
Prerequisites	COS 110
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English

Department	Computer Science
Period of presentation	Semester 2

Module content

Programming languages are the backbone for software development. Each language has its own different syntax and semantics, but there are many common concepts that can be studied and then illustrated through the languages. The module concentrates on issues of object orientation, including delegation, iteration and polymorphism. It surveys how languages provide the basic building blocks for data and control, as well as exception handling and concurrency. At the end of the module, students will be able to appreciate the rich history behind programming languages, leading to independent principles that evolve over time. They will be skilled at using a variety of programming languages, including new paradigms such as functional, logical and scripting, and will know how to learn a new language with ease. From this experience, they will be able to apply evaluation criteria for choosing an appropriate programming language in a given scenario.

Computer graphics 344 (COS 344)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics
Prerequisites	COS 110 and WTW 124 or WTW 146
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Computer Science
Period of presentation	Semester 1

Module content

The aim of this module is to acquire a sound knowledge of the basic theory of interactive computer graphics and basic computer graphics programming techniques. The theory will cover graphics systems and models, graphics programming, input and interaction, geometric objects and transformations, viewing in 3D, shading, rendering techniques, and introduce advanced concepts, such as object-oriented computer graphics and discrete techniques. The module includes a practical component that enables students to apply and test their knowledge in computer graphics. The OpenGL graphics library and the C programming language will be used for this purpose.

Spatial databases 787 (COS 787)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English

Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

This module covers the major themes of spatial databases with application to geographic information systems (GIS), i.e. systems concerning data with an implicit or explicit reference to a location relative to the earth. Topics covered include an introduction to spatial databases and spatial data management systems, representation of geographic data, spatial data modelling, computational geometry, spatial data indexing, query processing and spatial data standards. For Computer Science students the module is an introduction to the ever increasing application field of geographics information systems (GIS), and for Geoinformatics students the module provides insight into the Computer Science foundations of the field.

Animal anatomy and physiology 200 (DAF 200)

Qualification	Undergraduate
Module credits	32.00
Programmes	BSc Biotechnology BSc Biotechnology BScAgric Animal Science
Prerequisites	CMY 127 or permission from head of department
Contact time	4 lectures per week, 1 practical every 2nd week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

The body cavities, the origin of trunk wall and the principle arrangement of other anatomical structures as explained by the basic embryological development of mammals. Introduction to anatomy and anatomical terminology. Introduction to basic histology of cells, epithelial tissue and connective tissue. Basic anatomy of tissues, organs, systems and joints. Anatomy of the musculo-skeletal system integrated, the histology of connective tissue and muscles. The anatomy and histology of the integument and skin structures, the cardiovascular, respiratory, immune, endocrine, urogenital and digestive systems all of which serves as basis for the physiology component of the module. General species differences of the anatomy and histology where applicable.

Animal anatomy 310 (DAN 310)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	DAF 200
Contact time	1 lecture per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Animal and Wildlife Sciences

Period of presentation	Semester 1

Module content

Functional anatomy, growth and development of tissues and organ systems. Changes during maturation, reproduction, the post-partum period and lactation. Ageing and tissue changes with erosion diseases. The influence of hormones, production and reproduction on conformation and a critical evaluation of assessment of animals for functional efficiency.

Animal physiology 311 (DFS 311)

Qualification	Undergraduate
Module credits	10.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	DAF 200
Contact time	2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Homeostasis and Homeorhesis in animals: Thermoregulation. Adaptation of glucose, lipid and protein metabolism in response to short and long-term changes in the supply and balance of nutrients and to changes in tissue demand for nutrients during different physiological states. Deviations from normal homeostasis, metabolic diseases and the prevention thereof. Pathogenesis of inflammation and infections; immunity.

Growth physiology 320 (DFS 320)

Qualification	Undergraduate
Module credits	12.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	DFS 311
Contact time	1 practical every 2nd week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Functional anatomy, growth and development of tissues and organ systems. The underlying physiological processes in growth and development. Pre- and postnatal growth and factors which determine growth rate: growth curves, stimulants of growth, age, nutrition, breed, sex. Changes during maturation, reproduction, the post-partum period and lactation. Ageing and tissue changes with erosion diseases. The influence of hormones, production and reproduction on conformation and a critical evaluation of assessment of animals for functional efficiency.

Thesis: Rural development planning 990 (DPL 990)

Qualification	Postgraduate
Module credits	360.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Dietetic application of communication principles 222 (DTT 222)

Qualification	Undergraduate
Module credits	12.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	2nd-year status
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 2

Module content

A total diet approach to communicating food and nutrition messages using theoretical frameworks, including planning and evaluation of content as well as presentation skills.

Research methodology 801 (EBW 801)

Qualification	Postgraduate
Module credits	0.00
Programmes	PhD Tourism Management
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	Friday and Saturday classes
Language of tuition	Module is presented in English

Department	Economic and Management Sciences Deans Office
Period of presentation	Year

Module content

- Developing the background to a research problem, and developing a problem statement and propositions and hypotheses relevant to their study.
- Compiling a thorough literature review of the topics they intend to study.
- Approaches to research: An overview of the different approaches to research (qualitative, quantitative and mixed methods) and the philosophical approaches that underpin them (positivism, post-positivism, interpretivism, constructivism, critical theory and pragmatism).
- Different research designs in quantitative and qualitative methods, and appropriate sampling approaches for the different research designs.
- Qualitative research methodology: An overview of qualitative methods for organisational research. An overview of the different methodologies on a continuum between modernistic qualitative and post-modernistic qualitative research.
- Quantitative research methodology

Dissertation: Exploration geophysics 890 (EGF 890)

Qualification	Postgraduate
Module credits	180.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Thesis: Exploration geophysics 990 (EGF 990)

Qualification	Postgraduate
Module credits	360.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Basis in environmental health 772 (EHM 772)

Qualification	Postgraduate
Module credits	5.00
Programmes	BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	School of Health System and Public Health
Period of presentation	Year

Economics 110 (EKN 110)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematical Statistics BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics BSc Mathematics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

This module deals with the core principles of economics. A distinction between macroeconomics and microeconomics is made. A discussion of the market system and circular flow of goods, services and money is followed by a section dealing with microeconomic principles, including demand and supply analysis, consumer behaviour and utility maximisation, production and the costs thereof, and the different market models and firm behaviour. Labour market institutions and issues, wage determination, as well as income inequality and poverty are also addressed. A section of money, banking, interest rates and monetary policy concludes the course.

Economics 113 (EKN 113)

Qualification	Undergraduate
Module credits	15.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences
Service modules	Faculty of Natural and Agricultural Sciences

Prerequisites	At least 6 (70-79%) in Mathematics or 60% in both Statistics 113 and 123.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

Introduction to economics and principles of microeconomics
The scope of economics; the basic theory of demand and supply; price, income and cross elasticity of demand; consumer utility, the utility function and case studies in terms of the utility function; the theory of the firm in the short and long run; market structures, namely the perfect market, monopoly, oligopoly and monopolistic competition; public sector finances; microeconomics versus macroeconomics and economic statistics.

Economics 120 (EKN 120)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematical Statistics BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics BSc Mathematics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 110 GS or EKN 113 GS and at least 4 (50-59%) in Mathematics in the Grade 12 examination or 60% in STK 113 and concurrently registered for STK 123
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 2

Module content

This module deals with the core principles of economics, especially macroeconomic measurement the private and public sectors of the South African economy receive attention, while basic macroeconomic relationships and the measurement of domestic output and national income are discussed. Aggregate demand and supply analysis stands core to this course which is also used to introduce students to the analysis of economic growth, unemployment and inflation. The microeconomics of government is addressed in a separate section, followed by a section on international economics, focusing on international trade, exchange rates and the balance of payments. The economics of developing countries and South Africa in the global economy conclude the course.

Economics 123 (EKN 123)

Qualification	Undergraduate
Module credits	15.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	At least 6 (70-79%) in Mathematics or 60% in both Statistics 113 and 123; EKN 113 GS
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 2

Module content

National income and principles of macroeconomics
The mechanics of national income accounts, the Keynesian macroeconomic model, the money market, demand for money and money supply, money and credit creation and the role of the monetary authorities. The IS-LM model of macroeconomic equilibrium and monetary and fiscal policy applications. The aggregate demand and supply models with the debate between the classical school, the monetarists and the Keynesian school. The problems of inflation and unemployment. Macroeconomic issues, namely macroeconomic policy, international trade, the balance of payments and economic growth.

Economics 214 (EKN 214)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences

Prerequisites	EKN 110 GS & EKN 120 OR EKN 113 GS & EKN 123; & STK 110 GS OR STK 113 & STK 123 & STK 120/121 or concurrently registered for STK 120/121 OR WST 111 & WST121 are prerequisites instead of STK 120/121 or WST 111 and concurrently registered for WST 121.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

Macroeconomics
From Wall and Bay Street to Diagonal Street: a thorough understanding of the mechanisms and theories explaining the workings of the economy is essential. Macroeconomic insight is provided on the real market, the money market, two market equilibrium, monetarism, growth theory, cyclical analysis, inflation, Keynesian general equilibrium analysis and fiscal and monetary policy issues.

Economics 224 (EKN 224)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 110 GS & EKN 120 OR EKN 113 GS & EKN 123; & STK 110 GS OR STK 113 & STK 123 & STK 120/121 or concurrently registered for STK120/121 OR WST 111 & WST121 are prerequisites instead of STK 120/121 or WST 111 and concurrently registered for WST 121.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

Microeconomics
Microeconomic insight is provided into: consumer and producer theory, general microeconomic equilibrium, Pareto-optimality and optimality of the price mechanism, welfare economics, market forms and the production structure of South Africa. Statistic and econometric analysis of microeconomic issues.

Economics 234 (EKN 234)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Mathematics BSc Applied Mathematics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 214 and STK 120/121 or WST 121 OR concurrently registered for STK 120/121 or WST 121.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 2

Module content

Macroeconomics
Application of the principles learned in EKN 214 on the world we live in. We look at international markets and dynamic macroeconomic models, and familiarise the students with the current macroeconomic policy debates. We also take a look at the latest macroeconomic research in the world. The course includes topics of the mathematical and econometric analysis of macroeconomic issues.

Economics 244 (EKN 244)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 224 and STK 120/121 or WST 121 OR concurrently registered for STK 120/121 or WST 121.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 2

Module content

Microeconomics
From general equilibrium and economic welfare to uncertainty and asymmetric information. In this module we apply the principles learned in EKN 224 on the world around us by looking at the microeconomic principles of labour and capital markets, as well as reasons why the free market system could fail. We touch on the government's role in market failures. The course includes topics of the mathematical and econometric analysis of microeconomic issues.

Economics 310 (EKN 310)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 214, EKN 234 or EKN 224, EKN 244
Contact time	2 lectures per week, 1 discussion class per week
Language of tuition	Afrikaans and English are used in one class
Department	Economics
Period of presentation	Semester 1

Module content

Public finance
Role of government in the economy. Welfare economics and theory of optimality. Ways of correcting market failures. Government expenditure theories, models and programmes. Government revenue. Models on taxation, effects of taxation on the economy. Assessment of taxation from an optimality and efficiency point of view. South African perspective on public finance.

Economics 314 (EKN 314)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Mathematical Statistics BSc Mathematical Statistics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 234, EKN 244
Contact time	3 lectures per week

Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

International trade/finance
International economic insight is provided into international economic relations and history, theory of international trade, international capital movements, international trade politics, economic and customs unions and other forms or regional cooperation and integration, international monetary relations, foreign exchange markets, exchange rate issues and the balance of payments, as well as open economy macroeconomic issues.

Economics 320 (EKN 320)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 310 GS
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Economics
Period of presentation	Semester 2

Module content

Economic analyses
Identification, collection and interpretation process of relevant economic data; the national accounts (i.e. income and production accounts, the national financial account, the balance of payments and input-output tables); economic growth; inflation; employment, unemployment, wages, productivity and income distribution; business cycles; financial indicators; fiscal indicators; social indicators; international comparisons; relationships between economic time series - regression analysis; long-term future studies and scenario analysis; overall assessment of the South African economy from 1994 onwards.

Economics 325 (EKN 325)

Qualification	Undergraduate
Module credits	20.00

Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	EKN 214, EKN 234
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 2

Module content

Economic policy and development: Capita select
The course provides an introduction to growth economics and also to some topics on development economics. Firstly, historical evidence is covered and then the canonical Solow growth model and some of its empirical applications (human capital and convergence). Secondly, the new growth theory (the AK and the Romer models of endogenous growth) are covered. Some of the development topics to be covered include technology transfer, social infrastructure and natural resources.

Microeconomics 812 (EKN 812)

Qualification	Postgraduate
Module credits	10.00
Programmes	MPhil Economics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only for students in relevant programme
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

The module will first expose students to knowledge related to how individual consumers and firms behave under a very strict set of circumstances. Toward the end of the semester, the module will then begin to examine behaviour under less strict assumptions. The module covers in detail, firm behaviour, consumer behaviour, general equilibrium, behaviour under uncertainty and risk, strategic behaviour, information, game theory and to a lesser extent, the interaction between the government and the individual.

Macroeconomics 813 (EKN 813)

Qualification	Postgraduate

Module credits	10.00
Programmes	MPhil Economics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only for students in relevant programme
Contact time	3 lectures per week, 1 other contact session per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1 or Semester 2

Module content

The basic framework for this module will be infinitely-lived dynamic stochastic and non-stochastic macro models in both discrete and continuous time frames. Overlapping generation models will also be used to deal with certain topics. Topics include:
• The Lucas Critique
• Growth models
• Expectations
• Business cycles
• Basics of a new Keynesian business cycle model
• Overlapping generations models

Monetary economics and banking 816 (EKN 816)

Qualification	Postgraduate
Module credits	10.00
Programmes	MCom Economics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only for students in relevant programme
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1 or Semester 2

Module content

This module presents an advanced treatment of critical topics in monetary economics and the models economists use to investigate the interactions between real and monetary factors. It provides extensive coverage of general equilibrium (DSGE) models, models of the short-run real effects of monetary policy, and game-theoretic approaches to monetary policy. Among the topics covered are models of time consistency, monetary policy operating procedures, interest rates and monetary policy.
Throughout, this module focuses on the implications of interest rate control for monetary policy. The module is designed for advanced graduate students in monetary economics, economic researchers and economists working in policy institutions and central banks.
The module includes discussions of empirical evidence on the new Keynesian model, inflation forecast targeting models, optimal policies in forward-looking models, stability and the Taylor principle, and open economy new Keynesian models. It explicitly treats policy analysis in new Keynesian models and their underlying DSGE foundations for both a closed economy, a small open economy and a two-country world economy; the discussion includes the derivation of the policy objective function, optimal commitment and discretionary outcome, targeting rules and instrument rules.

Econometrics 713 (EKT 713)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only for BComHons: Agricultural Economics, Econometrics or Economics students
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

An introductory yet comprehensive course in econometrics, encompassing an in-depth examination of elementary statistics and regression analysis. This includes the fundamentals of simple and multiple regression analyses, as well as estimation, inference and hypothesis testing. Considerable attention is devoted to practical applications on current economic issues and examples drawn from the applied economic literature.

Introduction to statistical learning 720 (EKT 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	RAL 780 or WST 311, 312, 321

Contact time	1 web-based period per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

The emphasis is on the theoretical understanding and practical application of advances in statistical modelling. The following topics are covered: Single equation models: Nonparametric regression. Bootstrap procedures within regression analysis, k-nearest neighbour classification. Modelling categorical dependent variables - Logit/Probit models. Multiple outputs. Linear regression of an indicator matrix. Ridge regression. Non-linear regression modelling. Some new developments in regression and classification.
Simultaneous equation models: Specification, identification and estimation of simultaneous equation models.

Environment and development 811 (ENS 811)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Ecology (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Management (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The foundation of the module is the interrelations between societal and environmental dynamics. It deals with issues of social structure, culture, politics, education, migration, production, urbanisation, demographics and social institutions and how these impact upon the environment. Also dealt with is how the consequences of impacts, such as environmental change, in turn affect societies. Analysis of complex interrelationships between society and the environment, social-environmental linkages and multiplier effects are dealt with.

Strategic environmental management 822 (ENS 822)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Management (Coursework) MSc Forest Management and the Environment (Coursework)
Service modules	Faculty of Law

Prerequisites	No prerequisites.
Contact time	2 discussion classes per week, 5 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

Strategic environmental planning: introduction, objectives and principles; levels; South African overview; guidelines: national and international; strategy and management; structure, strategy and agency; South African guidelines; diagnostic tools; RESP analysis; strategic resource planning; applications, implementation and control; development and policy implementation; South African environmental policy; evaluation frameworks; portfolio analysis; competitive forces; alliances; business benefits; intangibles, survival and catalytic contributions; South African legislation and regulations.

Environment and land reform 823 (ENS 823)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The need and purpose of land reform in South Africa and its contribution towards sustainable social-environmental interaction. An overview of the global variety of land tenure systems, and tenure reform programmes in other countries. Overview of previous systems of land tenure in South Africa. Land reform policy in South Africa: restitution, redistribution, and tenure reform. Critical assessment of progress in terms of land reform objectives. Evaluation of the contribution of the South African land reform programme towards creating sustainable environments.

Social modelling and assessment 824 (ENS 824)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Management (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Management (Coursework)

Prerequisites	No prerequisites.
Contact time	5 discussion classes per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

In this module students will be introduced to the various methods of modelling and assessing social impacts. Specific emphasis will be placed upon modelling societal-economic-environmental interactions, formulating stochastic and dynamic models of population-development-environment interactions, conducting research to determine possible impacts of environmental changes on communities and performing social impact surveys. Students will be introduced to both quantitative as well as qualitative methods of conducting social impacts assessments.

Dissertation: Entomology 890 (ENT 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Entomology MSc Entomology MScAgric Entomology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Entomology 990 (ENT 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Entomology PhD Entomology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Introduction to environmental sciences 101 (ENV 101)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Meteorology BSc Environmental Sciences BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 1

Module content

Introducing the basic concepts and interrelationships required to understand the complexity of natural environmental problems, physical and human environment, human induced environmental problems, the ways in which the natural environment affects human society and biodiversity, an introduction to major environmental issues in Southern Africa and sustainable development in the context of environmental issues.

Human environmental interactions 301 (ENV 301)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSocSci Heritage and Cultural Tourism BSc Environmental Sciences BSc Geography BSc Meteorology
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 2

Module content

The module focuses on contemporary environmental issues in southern Africa. Recent and future impacts of human pressures on natural resources, the state of the environment in South Africa, management of critical resources, population trends, biodiversity loss, pollution, water scarcity, desertification, climate change, waste accumulation and management, environmental management tools, environmental education and environmental management legislation.

Research and presentation skills 703 (ENV 703)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

A module zooming in on research methodologies, data capturing techniques as well as visual and oral presentation skills. A significant part of the module assessment is constituted by the final presentation of the honours project contents.

Environmental compliance 727 (ENV 727)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Tools for achieving environmental compliance, constitutional and administrative requirements, environmental legislative requirements, criminal legislative requirements, business entities and liability, mandate and powers of environmental inspectors, enforcement ethics, networks and resources, conflict management.

Industrial environmental enforcement 728 (ENV 728)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	ENV 727
Contact time	5 lectures for period of one week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Health and safety during industrial enforcement, compliance inspection principles in industry, principles of investigation, environmental sampling and chain of custody of samples, interaction with ISO 14001, procedures during prosecution.

Industrial environmental enforcement 729 (ENV 729)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	ENV 727
Contact time	5 lectures for period of one week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Health and safety during industrial enforcement, compliance inspection principles in industry, principles of investigation, environmental sampling and chain of custody of samples, interaction with ISO 14001, procedures during prosecution.

Environmental assessments 785 (ENV 785)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Service modules	Faculty of Health Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

The aim of this module is to understand the principles and processes behind environmental assessments. The module will give an overview of the history of assessments, compare assessment processes internationally, evaluate the strengths and weaknesses of different approaches, provide an overview of the South African regulatory context and the environmental authorisation process.

Environmental paradigms 810 (ENV 810)

Qualification	Postgraduate
Module credits	15.00

Programmes	MSc Environmental Education (Coursework) MSc Air Quality Management (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Education (Coursework) MSc Environmental Management (Coursework) MSc Forest Management and the Environment (Coursework) MSc Water Resource Management (Coursework)
Prerequisites	No prerequisites.
Contact time	5 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

Environmental philosophy and ethics, environmental ecology, environment, society and development, environmental economics, environmental management, critical resources management: water utilisation, air quality control, land-use planning: soil characteristics, biodiversity planning, critical resource management: determinism vs co-evolutionary environmental frameworks, research methodology and practice.

Environmental analysis, assessment and modelling 812 (ENV 812)

Qualification	Postgraduate
Module credits	20.00
Programmes	MA Environment and Society (Coursework)
Prerequisites	No prerequisites.
Contact time	5 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Fundamentals of univariate statistics, classification and ordination, multivariate statistics, introduction to GIS and remote sensing tools for environmental analysis, spatial statistics, interpolation, kriging, trend surfaces, spatial autocorrelation, regression, risk assessment, social impact assessment.

Environmental law 816 (ENV 816)

Qualification	Postgraduate
Module credits	15.00

Programmes	MSc Environmental Education (Coursework) MSc Air Quality Management (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Education (Coursework) MSc Environmental Management (Coursework) MSc Forest Management and the Environment (Coursework) MSc Water Resource Management (Coursework)
Service modules	Faculty of Law
Prerequisites	No prerequisites.
Contact time	1 web-based period per week, 1 lecture per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1 or Semester 2

Module content

Legislation for sustainable development within the framework of international agreements, the different acts affecting water quality and water use, the SEMAs within the NEMA framework, the NEMA EIA regulations, legislation pertaining to hazardous substances, interaction between mining development and NEMA, energy law, strategic environmental legislation, marine and coastal management.

International environmental management systems 822 (ENV 822)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Environmental Ecology (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 lectures over a period of 1 week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

The ISO framework, environmental risks and opportunities for companies, global environmental concerns, environmental legislation, identification of environmental impacts, environmental certification and auditing, follow-up activities, the Forestry Stewardship Council framework, chain of custody requirements, production standards, FSC reporting.
(** additional costs involved for international UK certificate)

Trees in a multifunctional landscape 833 (ENV 833)

Qualification	Postgraduate

Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Environmental Ecology (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	1 web-based period per week, 5 discussion classes per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Quarter 3

Module content

Place and role of trees in multifunctional rural landscapes. Trees outside forests. Multipurpose trees. Trees and biodiversity. Trees and environmental services. Trees and sustainable development. Domesticated forests. Agroforestry (definition, classification, challenges and examples). Multiple use of forests and trees. Non-timber tree and forest products. Domestication of multipurpose trees. Forests and people. Trees and agricultural production systems (yield, interactions, synergy, competition, pests and diseases). Case-study examples from sub-Saharan Africa.

Mini-dissertation 891 (ENV 891)

Qualification	Postgraduate
Module credits	90.00
Programmes	MSc Environmental Education (Coursework) MSc Air Quality Management (Coursework) MSc Environment and Society (Coursework) MSc Environmental Ecology (Coursework) MSc Environmental Education (Coursework) MSc Environmental Management (Coursework) MSc Forest Management and the Environment (Coursework) MSc Water Resource Management (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

The student needs to conduct a research project under the supervision of an academic member of staff associated with the Centre for Environmental Studies. This project needs to be of a sufficient quality to be publishable in the open scientific literature. The research report is examined as a manuscript for a suitable journal.

Dissertation: Environmental ecology 892 (ENV 892)

Qualification	Postgraduate

Module credits	180.00
Programmes	MSc Environmental Ecology MSc Environmental Ecology
Prerequisites	No prerequisite.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Dissertation: Environment and society 893 (ENV 893)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Environment and Society MSc Environment and Society
Prerequisites	No prerequisite.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Dissertation: Environmental management 894 (ENV 894)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Environmental Management MSc Environmental Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Dissertation: Water resource management 896 (ENV 896)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Water Resource Management MSc Water Resource Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology

Period of presentation	Year

Dissertation: Environmental education 897 (ENV 897)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Environmental Education MSc Environmental Education
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Dissertation: Air quality management 898 (ENV 898)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Air Quality Management MSc Air Quality Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Water resource management 990 (ENV 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Water Resource Management PhD Water Resource Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Thesis: Environment and society 991 (ENV 991)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Environment and Society PhD Environment and Society

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Environmental ecology 992 (ENV 992)

Qualification	Postgraduate
Module credits	360.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Environmental economics 993 (ENV 993)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Environmental Economics PhD Environmental Economics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Thesis: Environmental management 994 (ENV 994)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Environmental Management PhD Environmental Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Air quality management 998 (ENV 998)

Qualification	Postgraduate
Module credits	360.00

Programmes	PhD Air Quality Management PhD Air Quality Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Introduction to environmental and occupational health 775 (EOH 775)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	School of Health System and Public Health
Period of presentation	Year

Academic literacy (1) 110 (EOT 110)

Qualification	Undergraduate
Module credits	6.00
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	1 other contact session per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Unit for Academic Literacy
Period of presentation	Semester 1

Module content

An introduction to academic literacy that considers various learning styles and strategies, and provides an initial exploration of the characteristics of academic language. The module focuses initially on academic listening and speaking. Practice in collecting information for academic tasks, as well as in the processing of academic information. In addition, the module has a focus on the enhancement of academic vocabulary, and some initial and elementary academic writing is attempted.

Academic literacy (2) 120 (EOT 120)

Qualification	Undergraduate
Module credits	6.00
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 other contact session per week
Language of tuition	Module is presented in English
Department	Unit for Academic Literacy
Period of presentation	Semester 2

Module content

While retaining an emphasis on the collection and processing of academic information, this module also provides sustained practice in academic reading. Similarly, we concentrate on building up an academic vocabulary specific to certain fields of study. The final part of the module brings together academic listening, reading and writing. The production of academic information in the form of argumentative writing is the focus here, i.e. we concentrate on producing academic discourse that is rational, coherent, clear and precise.

Aesthetics 121 (EST 121)

Qualification	Undergraduate
Module credits	9.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	OBG 111
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Presentation techniques: story boards and technical drawings. Presentation techniques using CAD.

Aesthetics: Product, consumer and environment 320 (EST 320)

Qualification	Undergraduate
Module credits	8.00

Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management
Prerequisites	OBG 111
Contact time	2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Introduction to aesthetics. The interaction between environment and consumers' aesthetic experience. Visual merchandising: basic components; tools and techniques; planning in clothing, interior and foods retail settings

Water quality management 810 (EWM 810)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Ecology (Coursework) MSc Environmental Ecology (Coursework) MSc Water Resource Management (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Severity of waterborne disease, accurate risk analysis, emergence of pathogens resistant to disinfection, the use of indicator organisms, toxicity risks, viral and protozoal contamination, water borne diseases surveillance, epidemiology of water borne diseases, water quality standards and monitoring, education.

Water conservation and demand management 821 (EWM 821)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Ecology (Coursework) MSc Environmental Ecology (Coursework) MSc Water Resource Management (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes
Language of tuition	Module is presented in English

Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Public access to information regarding water quality, water supply sustainability and public education, demand projections, water management efficiency systems approach to water management, watershed protection, drinking water treatment and distribution, wastewater collection and treatment, effects of deforestation and treatment, and complex water system developments, destruction of wetlands, effects of recreation, agriculture and aquaculture on eutrophication.

Water supply and sanitation 822 (EWM 822)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Ecology (Coursework) MSc Environmental Ecology (Coursework) MSc Water Resource Management (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Low technology water treatment options, sanitary engineering, high technology options, water disinfection methods, selection of treatment regimes, stormwater management.

Pharmacology 381 (FAR 381)

Qualification	Undergraduate
Module credits	18.00
Programmes	BDietetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FLG 211, FLG 212, FLG 221, FLG 222 GS
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Pharmacology
Period of presentation	Semester 1

Module content
Introduction, receptors, antagonism, kinetic principles, drugs that impact upon the autonomic and central nervous system, pharmacotherapy of hypertension, angina pectoris, myocardial infarction, heart failure, arrhythmias, and epilepsy. Diuretics, glucocorticosteroids, local anaesthetics, anaesthetic drugs, analgesics, iron and vitamins, oncostatics and immuno suppressants.

Pharmacology 382 (FAR 382)

Qualification	Undergraduate
Module credits	18.00
Programmes	BDietetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FAR 381, FLG 211, FLG 212, FLG 221, FLG 222 GS
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Pharmacology
Period of presentation	Semester 2

Module content

Hormones, drugs that act on the histaminergic, serotonergic, and dopaminergic receptors. Pharmacotherapy of diabetes mellitus, schizophrenia, depression, obesity, anxiety, insomnia, gastro-intestinal diseases. Anticoagulants, antimicrobial drugs.

Financial management 110 (FBS 110)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematical Statistics BSc Mathematical Statistics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Financial Management
Period of presentation	Semester 1

Module content

*Only for BSc (Mathematical Statistics. Construction Management, Real Estate and Quantity Surveying) and BEng (Industrial Engineering) students.
Purpose and functioning of financial management. Basic financial management concepts. Accounting concepts and the use of the basic accounting equation to describe the financial position of a business. Recording of financial transactions. Relationship between cash and accounting profit. Internal control and the management of cash. Debtors and short-term investments. Stock valuation models. Depreciation. Financial statements of a business. Distinguishing characteristics of the different forms of businesses. Overview of financial markets and the role of financial institutions. Risk and return characteristics of various financial instruments. Issuing ordinary shares and debt instruments.

Financial management 112 (FBS 112)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	At least 6 (70-79%) in Mathematics in the Grade 12 examination or WTW 133 (60%), WTW 143 (60%), WST 133 (60%) and WST 143 (60%).
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Financial Management
Period of presentation	Semester 1

Module content

*Only for students in BSc (Actuarial and Financial Mathematics), BSc (Mathematics), BSc (Applied Mathematics), BSc (Mathematical Statistics), BSc Extended programme – Mathematical Sciences and BCom (Statistics) who comply with the set prerequisites.

Key principles of financial management. Company ownership. Taxation. Introduction to financial statements. Structure of financial statements. Depreciation and reserves. Preparing financial statements. Group financial statements and insurance company financial statements. Interpretation of financial statements. Limitation of financial statements. Issue of share capital.

Financial management 120 (FBS 120)

Qualification	Undergraduate
Module credits	10.00

Programmes	BSc Mathematical Statistics BSc Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCom Financial Sciences, Investment Management and Law: FRK111 and FRK121 (or FRK100 or 101), STK110,120 or FBS121, and simultaneously registered for FRK211; BSc Construction Management, Quantity Surveying and Real Estate: FBS110, STK110 and STK120
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Financial Management
Period of presentation	Semester 2

Module content

*Only for BSc (Mathematical Statistics, Construction Management, Real Estate and Quantity Surveying) students. Analysis of financial statements. Budgeting and budgetary control. Tax principles and normal income tax for individuals. Time value of money and its use for financial and investment decisions. Calculating the cost of capital and the financing of a business to maintain the optimal capital structure. Capital investment decisions and a study of the financial selection criteria in the evaluation of capital investment projects. The dividend decision and an overview of financial risk management.

Financial management 122 (FBS 122)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Financial Management
Period of presentation	Semester 2

Module content

Financial instruments. Use of financial derivatives. Financial institutions. Time value of money. Component cost of capital. Weighted average cost of capital. Capital structure and dividend policy. Capital project appraisal. Evaluating risky investments.

Science and world views 155 (FIL 155)

Qualification	Undergraduate
Module credits	6.00

Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Medical Sciences
Service modules	Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Philosophy
Period of presentation	Semester 1

Module content

This is a broad introduction to the philosophy and history of science. Examples of themes and historical periods which are covered include: world views in ancient Greece; Socrates; Plato – the founder of Western thought; Aristotle – the foundation of a new tradition; Leonardo da Vinci; the foundation of modern science; the wonder years of the seventeenth century – the flourishing of the sciences and philosophy; the rising of mechanization; a drastic turn in man's vision – the rise of psychology; how the theory of relativity changed our view of the cosmos; quantum theory and its implications for the modern world view; the biological sciences and the secrets of life; the rise and role of psychology; the neuro-sciences; the place, role and benefit of philosophical thought in the sciences.

Introduction to moral and political philosophy 251 (FIL 251)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Philosophy
Period of presentation	Quarter 2, 3 and 4

Module content

In this module students are equipped with an understanding of the moral issues influencing human agency in economic and political contexts. In particular philosophy equips students with analytical reasoning skills necessary to understand and solve complex moral problems related to economic and political decision making. We demonstrate to students how the biggest questions concerning the socio-economic aspects of our lives can be broken down and illuminated through reasoned debate. Examples of themes which may be covered in the module include justice and the common good, a moral consideration of the nature and role of economic markets on society, issues concerning justice and equality, and dilemmas of loyalty. The works of philosophers covered may for instance include that of Aristotle, Locke, Bentham, Mill, Kant, Rawls, Friedman, Nozick, Bernstein, Dworkin, Sandel, Walzer, and MacIntyre.

Introductory and neurophysiology 211 (FLG 211)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Chemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	CMY 117, CMY 127, MLB 111 and PHY 131
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content

Orientation in physiology, homeostasis, cells and tissue, muscle and neurophysiology, cerebrospinal fluid and the special senses.
Practical work: Practical exercises to complement the theory.

Circulatory physiology 212 (FLG 212)

Qualification	Undergraduate
Module credits	12.00

Programmes	BDietetics BSc Biochemistry BSc Chemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	CMY 117, CMY 127, MLB 111 and PHY 131
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content

Body fluids; haematology; cardiovascular physiology and the lymphatic system. Practical work: Practical exercises to complement the theory.

Lung and renal physiology, acid-base balance and temperature 221 (FLG 221)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Chemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FLG 211 and FLG 212
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Structure, gas exchange and non-respiratory functions of the lungs; structure, excretory and non-urinary functions of the kidneys, acid-base balance, as well as the skin and body temperature control.
Practical work: Practical exercises to complement the theory.

Digestion, endocrinology and reproductive systems 222 (FLG 222)

Qualification	Undergraduate
Module credits	12.00
Programmes	BDietetics BSc Biochemistry BSc Chemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FLG 211 and FLG 212
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems.
Practical work: Practical exercises to complement the theory.

Industrial physiology 322 (FLG 322)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Human Physiology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content
Problem-orientated module, with the emphasis on occupational health and safety in the industrial environment. Integration of different physiological systems is required. Practical work: Exposure to occupational hygiene measurement techniques. *Students interested in pursuing postgraduate studies in OHS must take FLG 322.

Higher neurological functions 327 (FLG 327)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content
Overview of higher cognitive functions and the relationship between psyche, brain and immune system. Practical work: Applied practical work.

Cellular and developmental physiology 330 (FLG 330)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Human Genetics BSc Human Physiology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content

During this module the biology of cellular processes such as the cell cycle, cell death, migration and their related cellular signalling pathways will be discussed as well as their role in early stage embryology and age-related pathologies. Practical work: Exposure to applied molecular biology techniques.

Exercise and nutrition science 331 (FLG 331)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Mechanisms of muscle contraction and energy sources. Cardio-respiratory changes, thermo-regulation and other adjustments during exercise. Use and misuse of substances to improve performance. Practical work: Applied practical work

Applied and pathophysiology 332 (FLG 332)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology

Period of presentation	Semester 2

Module content

Integration of all the human physiological systems. Practical work: Applied practical work.

Introduction to food, nutrition and health 121 (FNH 121)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Food Science BSc Food Science BSc Nutrition
Prerequisites	Natural and Agricultural Sciences students
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

By 2050 the world will have to feed more than 8 billion people. This module provides the initial science base in Food, Nutrition and Health and introduces some scientific principles and fundamental concepts.
Lectures: Introduction to food choice as affected by social factors, religious influences, ethnicity, health, safety, economics, food sensory properties; Introduction to the food supply chain with special emphasis on the nutritional, environmental, ethical and safety issues that are of importance to consumers; Hunger - food needs, including food and nutrition security, nature of nutritional problems, approaches to combat over- and undernutrition; Introduction to nutrition: Nutrients in foods; nutrient composition of foods; bioavailability of nutrients; diet and chronic diseases; the keys to healthy eating; Introduction to functional chemical components of food; Introduction to food processing and preservation; Introduction to food safety, hazards and risks; Introduction to food quality and consumer preferences; Importance of food legislation to ensure a healthy and safe food supply including nutritional labelling; health and nutrition claims; Food, Nutrition and Health issues in the News.
Practical work: Principles and practice of basic concepts in food, nutrition and health.

Food and nutrition security 320 (FNH 320)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Nutrition BSc Nutrition
Prerequisites	Second year status or persmission from the HOD.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences

Period of presentation	Quarter 3

Module content

Global food system and food security, Livelihoods and household dynamics, Gender Issues.

Research project 400 (FNH 400)

Qualification	Undergraduate
Module credits	40.00
Programmes	BSc Nutrition BSc Nutrition
Prerequisites	Third-year status
Contact time	2 practicals per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

A laboratory-based, analytical research project on an approved topic in nutritional sciences is planned, executed and presented in the form of a written report.

Advanced food, nutrition and health 420 (FNH 420)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Nutrition BSc Nutrition
Prerequisites	Third-year status or permission from the HOD.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Discussion classes in advanced level of nutritional sciences in topics including Micronutrient metabolism in human health and disease, Nutritional Bioavailability, Nutrigenomics, Nutrition intervention, Nutrition and the metabolic syndrome. Problem solving and literature discussion.

International nutrition 421 (FNH 421)

Qualification	Undergraduate
Module credits	20.00

Programmes	BSc Nutrition BSc Nutrition
Prerequisites	Third year status
Contact time	2 discussion classes per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1 or Semester 2

Module content

Discussion classes in International Nutrition focus on the the most important current nutrition issues affecting populations worldwide. It includes identifying nutrition challenges and trends in both developing and developed countries. The course includes aspects of epidemiology, disease etiology, and consequences of under-nutrition and over-nutrition.

Finance and investment 700 (FNI 700)

Qualification	Postgraduate
Module credits	40.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

The application of modern techniques in financial management to the financing of corporate entities and the management of assets. Topics include: the theory of finance, valuation of investments, asset modelling, capital structure and the cost of capital, portfolio management, capital project appraisal and performance management.

General introduction to forestry 831 (FOR 831)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per block, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

What is forestry? Global forest resources. Natural forests and plantations in Southern Africa. Forestry systems (natural, multipurpose forests, plantation forestry, agroforestry). Sustainable forestry development policy and legislation. Silviculture and management of plantations. Forest certification. Effects of site and silviculture on wood quality. Forest harvesting, utilisation and forest wood products. Non-timber forest products of natural and plantation forests. Forests and woodlands management (forest planning; forest mensuration, growth and yield estimates and regulation). Environmental management of natural and plantation forests. Forestry research. Human resource management in forestry. This module will also have a field practical expedition to introduce students to the field experience.

Forest resource use planning and management 832 (FOR 832)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per block, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Forest planning. Forest mensuration. Growth and yield models and its application in growth and yield simulators. Quantitative silviculture. Yield regulation and forest economics. GIS and spatial analysis in forestry.

Forest engineering 833 (FOR 833)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per block, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Forest road engineering. Forest road system management. Forest operations analysis. Production planning. Strategic and tactical planning techniques. Forest operations design. Forest transportation systems. Harvesting management. Logging mechanics.

Wood science and forest products 834 (FOR 834)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per block, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Common characteristics of wood. Properties controlling the technical performance of wood. Natural growth phenomena affecting wood quality. Effect of site and silviculture on wood quality. The genetics of wood. Sawmilling and wood drying. Composite wood products. Deterioration of wood and wood products and methods of protection.

Forest ecology and management 835 (FOR 835)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Environmental Ecology (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per block, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Structure and function of natural forests, species composition and diversity, disturbance processes and regimes, recovery (succession) concepts and theory, biodiversity in forest ecosystems, energy and nutrient flux in natural forest ecosystems. Resource assessment and planning. Silvicultural systems and management of natural forests (and woodlands), natural regeneration and forest rehabilitation management for sustainability of natural forest ecosystems: multiple use for timber and non-timber forest products, forest rehabilitation (invader plants, mining, degraded forests).

Silviculture 836 (FOR 836)

Qualification	Postgraduate
Module credits	15.00

Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	20 discussion classes per week, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Understand the development of modern plantation forestry. Commercial plantation species. Forest pests and diseases. Forestry site classification. Basis of forestry rotation length (economics, biological, wood quality). Effect of silvicultural practices on wood quality (managing wood quality). Forestry management regimes for different species and end products. Pros and cons of plantation forestry on the environment. Fire management. Propagation techniques for forestry systems and bio-renewable resources, ecological basis of silviculture and fire management systems.

Dissertation: Forest science 890 (FOR 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Forest Science MSc Forest Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

*Interdepartmental programme. The curriculum is determined by the heads of department in the biological sciences and will include the research
methodology and scientific writing. This is followed by research in the area of the chosen specialization in Forest Science culminating in the preparation and
submission of research dissertation

Forest Science 990 (FOR 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Forest Science PhD Forest Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English

Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

*Interdepartmental programme. The curriculum is determined by the heads of department in the biological sciences and will include the research proposal
development and scientific writing. This is followed by research in the area of the chosen specialization in Forest Science culminating in the preparation and
submission of research dissertation: including submission of scientific papers for peer reviewed credited journals.

Chemical and microbiological aspects of food 451 (FPP 451)

Qualification	Undergraduate
Module credits	20.00
Prerequisites	Third-year status or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1 or Semester 2

Module content

Chemical aspects: The role and composition of the major chemical components of food (water, carbohydrates, proteins and lipids). The content and nutritional role of different minor chemical components of food (minerals and vitamins). The principles and control of enzymic and non-enzymic browning. The composition and use of enzymes in food processing. Microbiological aspects: Introduction to micro-organisms. Intrinsic and extrinsic factors that affect growth and survival of micro-organisms. Important microbial groups in food. Microbial spoilage of foods. Determination of micro-organisms and/or their products in foods. The preservation of foods. Microbial indicators of food safety and quality. Food borne diseases and intoxications. The utilisation of micro-organisms in food production.

Advanced courses 801 (FPP 801)

Qualification	Postgraduate
Module credits	90.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Mini-dissertation 890 (FPP 890)

Qualification	Postgraduate
Module credits	150.00

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Financial accounting 111 (FRK 111)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematics BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Applied Mathematics BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Mathematics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Law Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Accounting
Period of presentation	Semester 1

Module content

The nature and function of accounting; the development of accounting; financial position; financial result; the recording process; processing of accounting data; treatment of VAT; elementary income statement and balance sheet; flow of documents; accounting systems; introduction to internal control and internal control measures; bank reconciliations; control accounts; adjustments; financial statements of a sole proprietorship; the accounting framework.

Financial accounting 121 (FRK 121)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences BScAgric Agricultural Economics and Agribusiness Management

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
Prerequisites	FRK 111 GS
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Accounting
Period of presentation	Semester 2

Module content

Property, plant and equipment; intangible assets; inventories; liabilities; presentation of financial statements; enterprises without profit motive; partnerships; companies; close corporations; cash flow statements; analysis and interpretation of financial statements.

Financial accounting 122 (FRK 122)

Qualification	Undergraduate
Module credits	12.00
Programmes	LLB BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Law Faculty of Natural and Agricultural Sciences
Prerequisites	FRK 111 GS or FRK 133, FRK 143
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Accounting
Period of presentation	Semester 2

Module content

Budgeting, payroll accounting, taxation – income tax and an introduction to other types of taxes, credit and the new Credit Act, insurance, accounting for inventories (focus on inventory and the accounting entries, not calculations), interpretation of financial statements.

Financial accounting 133 (FRK 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences

Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Only available to the BCom Four-year programme
Contact time	Foundation Course, 3 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Accounting
Period of presentation	Semester 1

Module content

The nature and function of accounting; the development of accounting; financial position; financial performance; flow of documents; the recording process; processing of accounting data; treatment of VAT; elementary statement of comprehensive income (income statement) and statement of financial position (balance sheet).

Financial accounting 143 (FRK 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FRK 133; Only available to the BCom Four-year programme
Contact time	4 lectures per week, Foundation Course, 3 tutorials per week
Language of tuition	Module is presented in English
Department	Accounting
Period of presentation	Semester 2

Module content

Accounting systems; introduction to internal control and internal control measures; bank reconciliations; control accounts; adjustments; preparing the financial statements of a sole proprietorship; the accounting framework.

Physiology 110 (FSG 110)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science BSc Extended programme - Biological and Agricultural Sciences
Service modules	Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.

Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content

Introduction (terminology and anatomical orientation); chemical principles; cytology and histology; neuro-physiology and the senses; haematology and body fluids; cardiovascular system.

Physiology 120 (FSG 120)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science BSc Extended programme - Biological and Agricultural Sciences
Service modules	Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	FSG 110
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Respiratory system; nutrition; digestion and metabolism; kidneys and acid-base equilibrium; endocrinology; reproduction physiology and reproduction; skin and body temperatures.

Physics 116 (FSK 116)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Computer Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Introductory mathematics: Symbols, exponents, logarithms, angles in degrees, radial measure, goniometry, differentiation, and integration. Motion along a straight line: position and displacement, acceleration. Vectors: adding vectors, components, multiplying vectors. Motion in two and three dimensions: projectile motion, circular motion. Force and motion: Newton's Law, force, friction. Kinetic energy and work: work, power. Potential energy: Centre of mass, linear momentum. Collisions: impulse and linear momentum, elastic collisions, inelastic collisions. Rotation: kinetic energy of rotation, torque. Oscillations and waves: Simple harmonic motion, types of waves, wavelength and frequency, interference of waves, standing waves, the Doppler effect. Temperature, heat and the first law of thermodynamics.

Physics 176 (FSK 176)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Civil Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Introductory mathematics: Symbols, exponents, logarithms, angles in degrees, radial measure, goniometry, differentiation, and integration. Motion along a straight line: position and displacement, acceleration. Vectors: adding vectors, components, multiplying vectors. Motion in two and three dimensions: projectile motion, circular motion. Force and motion: Newton's Law, force, friction. Kinetic energy and work: work, power. Potential energy: Centre of mass, linear momentum. Collisions: impulse and linear momentum, elastic collisions, inelastic collisions. Rotation: kinetic energy of rotation, torque. Oscillations and waves: Simple harmonic motion, types of waves, wavelength and frequency, interference of waves, standing waves, the Doppler effect. Temperature, heat and the first law of thermodynamics.

Physics 700 (FSK 700)

Qualification	Postgraduate
Module credits	135.00
Programmes	BScHons Physics BScHons Physics
Prerequisites	No prerequisites.
Contact time	10 lectures per week, 1 other contact session per week, 1 discussion class per week, 1 seminar per week
Language of tuition	Module is presented in English

Department	Physics
Period of presentation	Year

Module content

The course content is determined by the Head of the Department of Physics. In addition to the usual subjects, viz. classical mechanics, quantum mechanics, statistical mechanics, electrodynamics, solid state physics, experiments or modelling, and a mini-research project, there are also elective subjects.

Mathematical methods 710 (FSK 710)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Medical Physics
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Series; complex analysis; Bessel and other special functions; integral transforms; Green functions

Classical dynamics 711 (FSK 711)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Medical Physics
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Advanced problems in classical dynamics; Hamilton formalism; canonical transformations; continuum mechanics

Quantum mechanics (I) 713 (FSK 713)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Medical Physics

Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Measurement process, General indefinite relations, Harmonic ossilator, symmetry, invariants and conservation laws, angular momentum, spin, perturbation theory, Schrödinger-Heisenberg and interaction pictures

Electrodynamics (I) 714 (FSK 714)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Medical Physics
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Poisson equation, Green functions, Maxwell equations.

Nuclear physics 727 (FSK 727)

Qualification	Postgraduate
Module credits	12.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Collective model, shell model, approximate nuclear structure methods, for example Hartree-Fock, random phase approximation, Tamm-Dankoff reaction theory and optical model

Physics 800 (FSK 800)

Qualification	Postgraduate
Module credits	1.00

Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Physics 808 (FSK 808)

Qualification	Postgraduate
Module credits	36.00
Programmes	MMed Anaesthesiology
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Dissertation: Physics 890 (FSK 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Physics MSc Physics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Thesis: Physics 990 (FSK 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Physics PhD Physics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Introduction to food science and technology 250 (FST 250)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Microbiology BSc Biotechnology BSc Food Science BSc Microbiology BScAgric Agricultural Economics and Agribusiness Management
Prerequisites	CMY 117 and CMY 127 and PHY 131 and WTW 134 or WTW 165 or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures: Food Science as a discipline. Activities of Food Scientists and Nutritionists. How food is produced, processed and distributed (food pipeline). World food problem. Human nutrition and human food requirements. Constituents of foods: Functional properties. Food quality. Food deterioration and control (food preservation). Unit operations in food processing. Food safety, risks and hazards. Principles of food packaging. Food legislation and labelling. Food processing and the environment. Practicals: Group assignments applying the theory in practice; practical demonstrations in pilot plants; guest lecturers on the world of food scientists and nutritionists; factory visit/videos of food processing.

Principles of food processing and preservation 260 (FST 260)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Microbiology BSc Culinary Science BSc Food Science BSc Microbiology
Prerequisites	CMY 117, CMY 127, MBY 161, PHY 131 and WTW 134 or WTW 165 or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1 and Semester 2

Module content

Lectures: Food preservation technologies: concept of hurdle technology; heat (blanching, pasteurisation and sterilisation); cold (refrigeration and freezing); concentration and dehydration; food irradiation; fermentation; preservatives; new methods of food preservation. Effect of various food preservation technologies on the microbiological (shelf-life and safety issues), sensory and nutritional quality of foods. Practicals: Practical applications of above processes. Physical, chemical and sensory evaluation of processed foods. Assignment: Application of hurdle technology concept to a specific food product.

Integrated food science 350 (FST 350)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Food Science
Prerequisites	Second-year status, FST 250 and FST 260 or permission from the HOD.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Literature studies and seminar presentations on topics in food science, nutrition and health.

Food chemistry 351 (FST 351)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Culinary Science BSc Food Science BSc Nutrition
Prerequisites	BCM 251 and BCM 252 and BCM 261 and BCM 262 or permission of the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures - Chemistry of major food components: Carbohydrates. Proteins. Lipids. Water. Chemical and nutritional aspects of food processing: implications of different processing techniques on the major food components. Functional properties of the major food components. Modification of functional properties of the major food components. Food analysis methodology. Practical work: Food analysis.

Food chemistry (2) 352 (FST 352)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Culinary Science BSc Food Science BSc Nutrition
Prerequisites	BCM 251 and BCM 252 and BCM 261 and BCM 262 or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures - Basic food analysis and chemistry of the minor food components: Basic food analysis, vitamins, minerals, additives, contaminants. Chemical and nutritional aspects of food processing: implications of different processing techniques on minor food components. Functional properties of the minor food components. Food analysis methodology. Practical work: Food analysis.

Food engineering 353 (FST 353)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Food Science
Prerequisites	FST 260 or permission from the HOD.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures: Mass and energy balance. Heat transfer theory: Convection, conduction and radiation. Energy for food processing. Fluid flow and rheology. Unit operations: materials handling, cleaning, sorting, grading, peeling, disintegration, separation (e.g. membrane technology), pumping, mixing and forming, heating, concentration, drying, extrusion, refrigeration, freezing. Tutorials/practicals: Calculations on mass and energy balances, psychrometry, refrigeration and freezing.

Chemistry of food macro- and micronutrients 355 (FST 355)

Qualification	Undergraduate
Module credits	18.00

Prerequisites	BCM 251 and BCM 252 and BCM 261 and BCM 262 or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Chemistry of food macro-nutrients: simple sugars, starch- and non-starch polysaccharides (including dietary fibre components), animal and plant proteins (including their indispensible amino acid composition), and lipids (including essential fatty acids, saturated and unsaturated fatty acids and trans fatty acids). Chemistry of food micro-nutrients: water-soluble vitamins (Vitamins B1, B2, niacin, B6, B12, folic acid, biotin and pantothenic acid, Vitamin C) and lipid-soluble vitamins (Vitamins A, D, E and K), bulk minerals and trace minerals.
Practical work: Principles and practice of food proximate analysis.

Principles of the science and technology of plant food 360 (FST 360)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Food Science
Prerequisites	FST 250, FST 260, FST 351 and FST 352 or permission from the HOD.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Cereal and legume grains, oilseeds and fruits and vegetables: Composition and structure. Quality assessment and grading. Post-harvest storage and physiology.
Cleaning and sorting principles and technologies. Milling – principles and technologies, and their effects on product functionality and nutrient composition. Juice and oil extraction – principles and technologies, and their effects on product functionality and nutrient composition. Bread and baked goods making – principles and technologies, and their effects on product functionality and nutrient composition. Practical work: Laboratory analyses of components and products of cereals, oilseeds, legumes and fruits and vegetables; Determination of quality; Factory visits.

Animal food science 361 (FST 361)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Food Science
Prerequisites	FST 250, FST 260, FST 351 and FST 352 or permission from the HOD.

Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Dairy science: Composition of milk; some physical properties of milk; factors affecting composition of milk; microbiological aspects of milk production; lactation; mechanical milking; milk defects; nutritive value of milk and milk products. Practical work: Chemical and microbiological tests of milk. Demonstration of the cheese-making process. Meat, poultry, fish and egg science: The composition, nutritional value and quality of meat, poultry, fish and eggs; factors affecting quality from slaughter or harvesting to consumption. Practical work: Visits to red meat and poultry abattoirs; quality determinations, egg quality and protein functionality.

Advanced animal and plant foods microbiology 362 (FST 362)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Microbiology BSc Food Science BSc Microbiology
Prerequisites	FST 260, MBY 251, MBY 261, MBY 262
Contact time	2 lectures per week, 180 minute practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

With an integrated focus on animal and plant food commodities, this module considers food properties and processing operations that impact on the growth, survival and biochemical activity of microorganisms as they relate to spoilage, safety and fermentation. Temperature effects on microbial growth and survival including thermal destruction and cell and spore injury. Microbial stress response (adaptation) during processing. Selection for stress resistant and more virulent pathogenic variants and virulence mechanisms (toxin structure/function) of food-borne pathogens during food processing. Theory and practice of new advances in microbial detection and identification methods. Tools for the production of safe foods including food safety objectives (FSOs) and risk analysis. Practicals will include advanced microbial detection and identification methods applied to animal and plant foods as well as the food supply chain.

Research methodology and seminar 400 (FST 400)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Nutrition BSc Nutrition

Prerequisites	Third-year status or permission from the HOD.
Contact time	1 day seminar in semester 2, 1 workshop of 5 days in semester 1
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Lectures and assignments: Research methodology. Literature study and seminar presentations on topics in food science and/or technology. The student must also pass an oral examination at the end of the module.

Animal food technology 401 (FST 401)

Qualification	Undergraduate
Module credits	20.00
Prerequisites	FST 361 or permission from the HOD.
Contact time	9 practicals per week, 30 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Dairy technology: The technology of fluid, concentrated, dried, frozen and fermented dairy products and starter cultures. Requirements for milk supply and other ingredients. Principles for the manufacturing of products in this category. Possible defects, causes and prevention. Practical work: Preparation of condensed milk, custard, ready-to-eat milk-based desserts, flavoured milk beverages, dairy-fruit juice mixtures; ice cream and other frozen desserts; yoghurt and cultured milk products; cheeses. Evaluation and analysis of the products. Effect of processing on nutritional value of dairy products. Factory visits. Meat, poultry, fish and egg technology: Meat, poultry, fish and egg processing and equipment. Meat emulsion, curing, dehydration and fermentation technology. Preservation and storage. Packaging. Legislation. Quality control and hygiene. Effect of processing on nutritional value of meat products. Practical work: Manufacturing of dried, cured, fermented and emulsion type products. Visits to processing factories.

Advanced plant food science and technology 402 (FST 402)

Qualification	Undergraduate
Module credits	20.00
Prerequisites	FST 360 or permission from the HOD.
Contact time	5 practicals S1, 5 discussion classes in semester 2, 8 discussion classes in semester 1, 3 practicals S2
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Plant food functionality: Starch, non-starch polysaccharides, protein. Advanced rheology and texture. Malting and brewing. Ready-to-eat (RTE) technologies and their impact on functional and nutritional quality. Plant oil processing. Minimal processing of fruits and vegetables. Practical work: Pasting properties of starch; Dough rheology; Isolation of legume and cereal proteins; SDS-PAGE electrophoreses of legume and cereal proteins; Malting and mashing of sorghum and barley malt; Extraction of essential oils; Extraction and identification of phenolic compounds; Minimal processing of fruits and vegetables.

Sensory evaluation 412 (FST 412)

Qualification	Undergraduate
Module credits	10.00
Programmes	BConSci Food Retail Management BConSci Food Retail Management BSc Culinary Science
Prerequisites	FST 260, FST 351 and FST 352 or permission from the HOD.
Contact time	12 discussion classes, 6 practicals per semester
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Principles and applications of sensory evaluation. Types of panels, tests and test conditions and their functions. Selection and training of panellists for descriptive sensory evaluation. Instrumental sensory quality measurements. Statistical analysis and interpretation of data. Practicals: Practical aspects and execution of sensory evaluation techniques, analysis and interpretation of data. Instrumental sensory quality measurements.

Product development and quality management 413 (FST 413)

Qualification	Undergraduate
Module credits	30.00
Prerequisites	FST 260 or permission from the HOD and FST 351 and FST 352
Contact time	15 discussion classes, 6 practicals per semester
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures: Principles involved and steps that are followed to develop new food products that are safe, tasty, nutritious and cost effective. Application of the theory of food product development. Quality management systems with specific reference to Good Manufacturing Practices, HACCP and ISO 9000. National and international standards, Codex Alimentarius, FDA. Application of food legislation. Food Packaging. Practicals: A product development project will be planned, conducted and presented. Application and implementation of HACCP.

Advanced food science 420 (FST 420)

Qualification	Undergraduate
Module credits	20.00
Prerequisites	Third-year status or permission from the HOD.
Contact time	12 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Discusion classes in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion.

Research project 463 (FST 463)

Qualification	Undergraduate
Module credits	40.00
Prerequisites	Third-year status in Food Science or permission from the HOD.
Contact time	1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Planning, execution and reporting of a research project on a selected Food Science and/or Technology subject.

Research methodology and seminars 700 (FST 700)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Food Science BScHons Food Science
Prerequisites	No prerequisites.

Contact time	1 day seminar in semester 2, 1 workshop of 5 days in semester 1
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Lectures and assignments: Research methodology. Literature study and seminar presentations on topics in Food Science and/or Technology. The candidate must also pass an oral examination at the end of the module.

Animal food technologies 701 (FST 701)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	9 practicals, 30 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Dairy technology: The technology of fluid, concentrated, dried, frozen and fermented dairy products and starter cultures. Requirements for milk supply and other ingredients. Principles for the manufacturing of products in this category. Possible defects, causes and prevention.
Practical work: Preparation of condensed milk, custard, ready-to-eat milk-based desserts, flavoured milk beverages, dairy-fruit juice mixtures; ice cream and other frozen desserts; yoghurt and cultured milk products; cheeses. Evaluation and analysis of the products. Effect of processing on the nutritional value of dairy products. Factory visits.
Meat, poultry, fish and egg technology: Meat, poultry, fish and egg processing and equipment. Meat emulsion, curing, dehydration and fermentation technology. Preservation and storage. Packaging. Legislation. Quality control and hygiene. Effect of processing on the nutritional value of meat products.
Practical work: Manufacturing of dried, cured, fermented and emulsion type products. Visits to processing factories.

Advanced plant food science and technologies 702 (FST 702)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	5 discussion classes in semester 2, 3 practicals S2, 5 practicals S1, 8 discussion classes in semester 1
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences

Period of presentation	Year

Module content

Plant food functionality: Starch, non-starch polysaccharides, protein. Advanced rheology and texture. Malting and brewing. Ready-to-eat (RTE) technologies and their impact on functional and nutritional quality. Plant oil processing. Minimal processing of fruits and vegetables. Practical work: Pasting properties of starch; Dough rheology; Isolation of legume and cereal proteins; SDS-PAGE electrophoreses of legume and cereal proteins; Malting and mashing of sorghum and barley male; Extraction of essential oils; Extraction and identification of phenolic compounds; Minimal processing of fruit and vegetables.

Sensory evaluation 712 (FST 712)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Food Science BScHons Food Science
Prerequisites	No prerequisites.
Contact time	12 discussion classes, 6 practicals per semester
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures: principles and applications of sensory evaluation. Types of panels, tests and test conditions and their functions. Selection and training of panellists for descriptive sensory evaluation. Instrumental sensory quality measurements. Statistical analysis and interpretation of data.
Practicals: Practical aspects and execution of sensory evaluation techniques, analysis and interpretation of data. Instrumental sensory quality measurements.

Production development and quality management 713 (FST 713)

Qualification	Postgraduate
Module credits	25.00
Programmes	BScHons Food Science BScHons Food Science
Prerequisites	No prerequisites.
Contact time	6 practicals per semester, 15 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Lectures: principles involved and steps that are followed to develop new food products that are safe, tasty, nutritious and cost effective. Application of the theory of food product development. Quality management systems with specific reference to Good Manufacturing Practices, HACCP and ISO 9000. National and international standards, Codex Alimentarius, FDA. Application of food legislation. Food packaging.
Practicals: A product development project will be planned, conducted and presented. Application and implementation of HACCP.

Advanced food science 720 (FST 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Food Science BScHons Food Science
Prerequisites	No prerequisites.
Contact time	12 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Discussion classes in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion.

Research project 763 (FST 763)

Qualification	Postgraduate
Module credits	40.00
Programmes	BScHons Food Science BScHons Food Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

A short research project on an approved topic in food science and/or technology is planned, executed and presented in the form of a written report.

Dissertation: Food science 890 (FST 890)

Qualification	Postgraduate
Module credits	180.00

Programmes	MSc Food Science MSc Food Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Each candidate must write a dissertation on his/her research project in Food science and/or Food technology and at least a concept research paper for publication in a peer-reviewed scientific journal.

Thesis: Food science 990 (FST 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Food Science PhD Food Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Advanced environmental soil chemistry 771 (GDK 771)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Soil Science Environmental Soil Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Advanced theoretical and experimental soil chemistry, including the organic fraction.

Advanced environmental soil physics 772 (GDK 772)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Soil Science Environmental Soil Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Advanced theoretical soil physics with the emphasis on mathematical modelling of fluxes of water, heat and solutes.

Plant nutrition, soil biology and soil fertility 773 (GDK 773)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Study of the latest trends and developments in plant nutrition, soil biology and soil fertility.

Research project in environmental soil science 775 (GDK 775)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Soil Science Environmental Soil Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Research project on a practical aspect of Environmental Soil Science.Literature review, formulation of a problem statement, hypotheses and aims of the research, as well as the design and execution of a laboratory or field scale trial. Project to be written up in a specific scientific format suitable for publication with an oral and visual presentation on the research.

Advanced coursework 801 (GDK 801)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Any module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

Dissertation: Soil science 890 (GDK 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Soil Science MSc Soil Science MScAgric Soil Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presentation of the research results. In addition to the dissertation, the student is also expected to compile a concept research paper for publication

Dissertation: Soil science 891 (GDK 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English

Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Each candidate must write a dissertation on his/her research project in Land-Use planning and at least prepare a concept research paper for publication in a peer-reviewed scientific journal.

Thesis: Soil science 990 (GDK 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Soil Science PhD Soil Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presenting of the research results. In addition to the thesis, the student is also expected to publish at least one research paper in a peer-reviewed, UP accredited scientific journal. An oral examination covering Soil Science and other fields related to the thesis will be conducted after the thesis has been accepted by examiners. A candidate needs to pass both the written thesis and oral examination to qualify for the degree.

Dissertation: Geography 890 (GGF 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Geography MSc Geography
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Thesis: Geography 990 (GGF 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Geography PhD Geography

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Aspects of human geography 156 (GGY 156)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Meteorology BSc Chemistry BSc Environmental Sciences BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 2

Module content

This module begins by fostering an understanding of human geography. Then follows with the political ordering of space; cultural diversity as well as ethnic geography globally and locally; population geography of the world and South Africa: and four economic levels of development. The purpose is to place South Africa in a world setting and to understand the future of the country.

Southern African geomorphology 166 (GGY 166)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Meteorology BSc Chemistry BSc Environmental Sciences BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics BSc Meteorology

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 3

Module content

Investigating southern African landscapes and placing them in a theoretical and global context. The geomorphological evolution of southern Africa. Introduction to the concepts of Geomorphology and its relationships with other physical sciences (e.g. meteorology, climatology, geology, hydrology and biology). The processes and controls of landform and landscape evolution. Tutorial exercises cover basic techniques of geomorphological analysis, and topical issues in Geomorphology.

Process geomorphology 252 (GGY 252)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Geography BSc Meteorology BSc Physics
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	GGY 166 or GLY 155
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 2

Module content

Physical processes that influence the earth’s surface and management. Specific processes and their interaction in themes such as weathering; soil erosion; slope, mass movement and fluvial processes. Practical laboratory exercises are based on the themes covered in the module theory component.

Geomorphology of the built environment 265 (GGY 265)

Qualification	Undergraduate

Module credits	12.00
Programmes	BSc Physics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 3

Module content

*This module is for Architecture and Landscape Architecture students only.
The theory component covers geomorphological aspects of the built environment including landscape identification; weathering or deterioration of natural stone and application to design and preservation of buildings and monuments; slope hydrology and stability conditions; soil erosion processes and construction impacts; drainage modification in urban areas; wetland identification, human impacts and rehabilitation; recreational impacts and management. In addition to the theory a field-based project is undertaken.

City structure, environment and society 266 (GGY 266)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Geography BSc Meteorology BSc Physics
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

An urbanising world. Urban structure and land use. Urban processes. The urban environment. Social structure and change in cities. Living in the city. Economy, society and politics in the city. Third-world cities and South African cities. Urban futures.

Introductory geographic information systems 283 (GGY 283)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Environmental Sciences BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Geology BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities
Prerequisites	GMC 110
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Introduction to Geographic Information Systems (GIS), theoretical concepts and applications of GIS. The focus will be on the GIS process of data input, data analysis, data output and associated technologies. This module provides the foundations for more advanced GIS and Geoinformatics topics.

Sustainable development 356 (GGY 356)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Environmental Sciences BSc Geography BSc Meteorology
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 1

Module content

The module conceptually integrates environmental, economic, and social components of sustainable development. Other topics covered include changing perceptions on development and environment, development paradigms, challenges of sustainable development, actors and actions in sustainable development, rural and urban livelihoods, and a Third World assessment of sustainable development in the developing world.

Environmental geomorphology 361 (GGY 361)

Qualification	Undergraduate
Module credits	18.00
Programmes	BPolSci International Studies BSc Environmental Sciences BSc Geography
Service modules	Faculty of Humanities
Prerequisites	GGY 252 and only for students studying BSc (Geography) or BSc (Environmental Sciences).
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 4

Module content

*Note: The module is available for BSc (Geography) and BSc (Environmental Sciences) students only. The theory content of this module is the same as GGY 363 and students are not allowed to earn credits for both GGY 361 and GGY 363.

Interactions of geomorphic processes within the physical and built environments; themes such as geomorphology and environmental change, slope processes and the environment, geomorphic risks and hazards, soil erosion and conservation, geomorphology in environmental management, applied weathering. Practicals involve fieldwork including sampling and mapping and subsequent laboratory analysis.

Applied geomorphology 363 (GGY 363)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Chemistry BSc Meteorology
Service modules	Faculty of Education
Prerequisites	GGY 252
Contact time	4 lectures per week
Language of tuition	Module is presented in English

Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 4

Module content

*Note: The content of this module is the same as GGY 361 and students are not allowed to earn credits for both GGY 361 and GGY 363.
Interactions of geomorphic processes within the physical and built environments; themes such as geomorphology and environmental change, slope processes and the environment, geomorphic risks and hazards, soil erosion and conservation, geomorphology in environmental management, applied weathering.

Development frameworks 366 (GGY 366)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Environmental Sciences BSc Geography BSc Meteorology
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 3

Module content

Classic development frameworks. Spatial development history and legacy in South Africa. Overview of contemporary environmental legislation in South Africa. Rural development strategy. Rural and agricultural reconstruction. Land reform. Urban development and strategy. Urban spatial reconstruction. National spatial development frameworks.

Selected theme 701 (GGY 701)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Contact time	1 web-based period per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology

Period of presentation	Year

Module content

A self-study module on an aspect or aspects of geographical or environmental science selected in consultation with the head of the department from: (a) themes not covered in existing options; or (b) educational subjects.

Research project 702 (GGY 702)

Qualification	Postgraduate
Module credits	35.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

An approved individual research project, carried out under the guidance of a lecturer. The project culminates in a research report in the format of a research paper and presentation. The student is expected to obtain the respective skills (theoretical and practical research techniques, data analysis, communication and computer skills) necessary for the research topic.

Geographical and environmental principles 710 (GGY 710)

Qualification	Postgraduate
Module credits	25.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

The module provides a critical review of the structures and paradigms in which the geographical and environmental sciences are practised. Particular reference is made to the development and impact of paradigms and the interdependence of systems within space and time.

Applied geomorphology 718 (GGY 718)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

This module focuses on processes and applications of geomorphology. Topics that may be studied include: soil erosion and conservation, weathering, geomorphic response to environmental change, slope processes and geomorphological hazards. The module includes practical fieldwork and field assessments.

Urban geography 780 (GGY 780)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The main themes of the module include: overview of global urbanisation theories and processes; urban morphology and change; the administrative structure and functions of African cities and; the quality of urban life in the developing world.

Environmental change 789 (GGY 789)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Service modules	Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology

Period of presentation	Year

Module content

Study themes include past environmental change, causes and consequences of human-induced environmental change and South Africa and climate change.

Aspects of land reform and the environment 793 (GGY 793)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geography and Environmental Science BScHons Geography and Environmental Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

The module aims to provide students with an understanding and knowledge of contemporary land reform issues against the background of international land reform experiences. The module also touches on other rural development strategies and ultimately aims to enhance the student's ability to conceptualise and analyse policy in the context of broader environmental issues.

Geographic data analysis 220 (GIS 220)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GMC 110 and (STK 110 OR BME 120)
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

The nature of geographical data and measurement.Application of statistics in the geographical domain. Probability, probability distributions and densities, expected values and variances, Central Limit theorem. Sampling techniques. Exploratory data analysis, descriptive statistics, statistical estimation, hypothesis testing, correlation analysis and regression analysis.

Geographic information systems introduction 221 (GIS 221)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Plant Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Geography BSc Geology BSc Plant Science BSc Zoology
Prerequisites	Prohibited combination GGY 283
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

*GIS 221 does not lead to admission to any module at 300 level.
Introduction to Geographic Information Systems (GIS), theoretical concepts and applications of GIS. The focus will be on the GIS process of data input, data analysis, data output and associated technologies.This module teaches students to use GIS as a tool.

Geographic information systems 310 (GIS 310)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Geology BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GGY 283

Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Advanced theory and practice of Geographic Information Systems; GIS applications; design and implementation of GIS applications. A project or assignments of at least 64 notional hours.

Geoinformatics 311 (GIS 311)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Meteorology BSc Geoinformatics BSc Meteorology
Prerequisites	(GGY 283 and INF 164 and INF 261) or (GGY 283 and WKD 254) For BSc (Geoinformatics) and BSc (Meteorology) students only.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Advanced geoinformatics topics in geovisualisation and geocomputation. A project or assignments of at least 64 notional hours.

Spatial analysis 320 (GIS 320)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Environmental Sciences BSc Chemistry BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Geology BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GIS 310 or permission from the HOD.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English

Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Construction of Raster Geovisualisations, spatial model construction and use, multi-criteria decision analysis. Factor analysis: Principle component analysis. Geostatistics: Spatial dependence modelling, ordinary kriging. Markov chains and cellular Automata, combined models. A project or assignment of at least 64 notional hours.

Research methods 701 (GIS 701)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Contact time	14 contact hours
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 1

Module content

The module introduces students to planning, research design, scientific reading, writing and presentation as required for geoinformatics research.

Research project 702 (GIS 702)

Qualification	Postgraduate
Module credits	35.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

An approved individual Geoinformatics research project with a system design and/or spatial analysis component. The project is carried out under the guidance of a lecturer. The student is expected to obtain the respective skills necessary for the research topic. Compilation of a research proposal. Literature survey. Selecting an appropriate research method. Carrying out of the research. Preparation of a research report.

GIS professional practice 703 (GIS 703)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Geoinformatics BScHons Geoinformatics
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Professionalism, including professional ethics, professional practices, partnerships, client relationships, SA Council for Professional and Technical Surveyors (including legislation and rules), and social responsibility. Relevant legislation, including Promotion of Access to Information Act and Spatial Data Infrastructure Act. Role of international associations/societies in Geoinformatics.

Spatial statistics and geodesy 704 (GIS 704)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Prerequisites	GMC 310 and GIS 320 or equivalent
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Principles of least squares in statistics, Spatial least squares regression, Surface interpolation using least squares and coordinate transformations. Topics in Geodesy: Space based measurement systems, sea level measurements, Determination of the geoid, earth axis orientation determination and earth dynamics.

Advanced geospatial data 705 (GIS 705)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Prerequisites	GIS 310 or equivalent
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Advanced topics in geospatial data management, such as data quality assurance, data quality assessment and the supply chain for geospatial data acquisition.

Internet GIS 706 (GIS 706)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Prerequisites	INF 164 or equivalent
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

This module aims to explore the Internet as a platform for accessing and delivering geospatial data and services. Students will be exposed to the theory and practice of technologies and technology approaches that make Internet GIS a reality. From the basic building blocks of Internet GIS, to advanced Spatial Data Infrastructure concepts, this module covers current and emerging issues in bringing geospatial data and processes to the wider world. Students will be required to reflect on the implications of using such technologies. A significant portion of the module will involve 'hands-on' work in designing and building Internet GIS applications and accessing Internet-based data and services. This module also includes consideration of a number of case studies within different problem domains. Students should leave the module with an understanding of the building blocks that make Internet GIS possible and be able to consider what are good practices in the development of Internet GIS applications and services.

Special topics 707 (GIS 707)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Geoinformatics BScHons Geoinformatics
Prerequisites	No prerequisites.
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

A special topic in Geoinformatics linked to research specialisation in the department and/or visiting lecturers. For example, research trends and advances in a specific topic or field of specialisation in Geoinformatics.The module is presented in the form of guided advanced readings, seminars and/or discussion sessions.

Dissertation: Geoinformatics 890 (GIS 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Geoinformatics MSc Geoinformatics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Thesis: Geoinformatics 990 (GIS 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Geoinformatics PhD Geoinformatics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Introductory soil science 250 (GKD 250)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Plant Science BSc Biotechnology BSc Chemistry BSc Ecology BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Geography BSc Geology BSc Meteorology BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CMY 117 GS or permission from the HOD
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Origin and development of soil, weathering and soil formation processes. Profile differentiation and morphology. Physical characteristics: texture, structure, soil water, atmosphere and temperature. Chemical characteristics: clay minerals, ion exchange, pH, buffer action, soil acidification and salinisation of soil. Soil fertility and fertilisation. Soil classification. Practical work: Laboratory evaluation of simple soil characteristics. Field practicals on soil formation in the Pretoria area.

Soil chemistry 320 (GKD 320)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Engineering and Environmental Geology BSc Geography BSc Geology BSc Meteorology BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

The more exact chemistry of soils systematically explained by understanding the particular chemical principles. Charge origin. Chemical equilibriums. Manifestations of sorption. Ion exchange. Acidic soils, saline soils and the organic fraction of soil. The chemistry of the important plant nutrient elements P, K and N is explained.

Soil classification and surveying 350 (GKD 350)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Engineering and Environmental Geology BSc Environmental Sciences BSc Geography BSc Geology BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

A taxonomic system for South Africa. USDA’s Soil Taxonomy. Land suitability evaluation. Optimal resource utilization. The conservation component. Ecological aspects. Ecotype, land types. Soil maps. Practical work: Field practicals and compulsory excursion. Identification of soil horizons, forms and families. Land suitability evaluation. Elementary mapping exercise.

Soil fertility, soil microbiology and plant nutrition 420 (GKD 420)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250 GS
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Soil ultimately controls nutrient supply to plants and organisms. The health and resilience of biota are therefore closely link to the interaction between the pedosphere and the biosphere. This course deals with the availability and uptake of macro and micro nutrients in the plant - microbial– soil system, nutrient deficiencies and toxicities, as well as soil properties and soil environmental conditions that influence soil fertility and its suitability to act as a growth medium. Practical work includes the laboratory evaluation of soil fertility and greenhouse pot trials to investigate nutrient uptake as well as deficiencies and toxicities symptoms in plants.

Mini-dissertation 881 (GLG 881)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

A dissertation on a topic approved by the course leader. In this module the candidate must do a research project in order to show that they have mastered the theoretical knowledge covered in the theoretical modules and can apply it to a research topic from their own industrial experience.

Dissertation: Geology 890 (GLG 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Geology MSc Geology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Thesis: Geology 990 (GLG 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Geology PhD Geology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology

Period of presentation	Year

Introduction to geology 155 (GLY 155)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Engineering and Environmental Geology BSc Extended programme - Physical Sciences BSc Geography BSc Geology BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	A candidate must have passed Mathematics with at least 60% in the Grade 12 examination.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

Solar system; structure of solid matter; minerals and rocks; introduction to symmetry and crystallography; important minerals and solid solutions; rock cycle; classification of rocks. External geological processes (gravity, water, wind, sea, ice) and their products (including geomorphology). Internal structure of the earth. The dynamic earth – volcanism, earthquakes, mountain building – the theory of plate tectonics. Geological processes (magmatism, metamorphism, sedimentology, structural geology) in a plate tectonic context. Geological maps and mineral and rock specimens.

Earth history 163 (GLY 163)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Engineering and Environmental Geology BSc Extended programme - Physical Sciences BSc Geography BSc Geology BSc Meteorology BSc Physics
Prerequisites	GLY155; a special exemption is given to 2nd-year students registered for degrees in Plant Sciences, Entomology, Ecology and Zoology
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English

Department	Geology
Period of presentation	Semester 2

Module content

This module will give an overview of earth history, from the Archaean to the present. Important concepts such as the principles of stratigraphy and stratigraphic nomenclature, geological dating and international and South African time scales will be introduced. A brief introduction to the principles of palaeontology will be given, along with short descriptions of major fossil groups, fossil forms, ecology and geological meaning. In the South African context, the major stratigraphic units, intrusions and tectonic/metamorphic events will be detailed, along with related rock types, fossil contents, genesis and economic commodities. Practical work will focus on the interpretation of geological maps and profiles.

Sedimentology 253 (GLY 253)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	CMY 117, CMY 127, GLY 155, GLY 163, WTW 114/WTW 158 and PHY 114
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 2

Module content

Introduction to sedimentology; grain studies; composition and textures of sedimentary rocks; flow dynamics and behaviour of sediment particles in transport systems; description and genesis of sedimentary structures; diagenesis; depositional environments and their deposits, modern and ancient; chemical sedimentary rocks; economic sedimentology; field data acquisition from sedimentary rocks and writing of reports; sieve analysis; Markov analysis; analysis of palaeocurrent trends; interpretation of sedimentary profiles.

Fundamental and applied mineralogy 255 (GLY 255)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	CMY 117, CMY 127, GLY 155, GLY 163,WTW 158 and PHY 114
Contact time	4 lectures per week, 2 practicals per week

Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 1

Module content

Fundamental concepts in mineralogy, and practical applications of mineralogy, including: the basics of crystal structure; the crystallographic groups; the rules of atomic substitution; phase transitions and phase diagrams; the structure and uses of olivine, pyroxene, feldspar, amphibole, mica, aluminosilicates, garnet, cordierite, and more uncommon mineral groups such as oxides, sulphides and carbonates; the calculation of mineral formulae from chemical analyses using various methods. Practical sessions: the basics of optical mineralogy and the use of transmitted light microscopy for thin section examination of minerals and rocks; the practicals will develop mineral identification skills for the minerals covered in the lectures, and cover basic textural identification.

Geology for engineering 256 (GLY 256)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Civil Engineering Engage
Prerequisites	Only for BEng Mining Engineering and BEng Civil Engineering students.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

This module is given to Mining and Civil Engineering students, focused on the practical application of basic geological principles to engineering problems. The course covers basic rock identification, principles of stratigraphy and landscape formation, and engineering applications of geology such as mining, slope stability, and civil applications. Practicals cover geological maps and profiles, as well as basic rock identification.

Igneous petrology 261 (GLY 261)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	GLY 255
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology

Period of presentation	Quarter 3

Module content

Classification and nomenclature of igneous rocks. The nature of silicate melts; physical and chemical factors influencing crystallisation and textures of igneous rocks. Phase diagrams, fractional crystallisation and partial melting. Trace elements and isotopes, and their use in petrogenetic studies. Global distribution of magmatism and its origin. Mid-oceanic ridges, active continental margins, intraplate magmatism.

Metamorphic petrology 262 (GLY 262)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	GLY 255
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 4

Module content

Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments.

Geological field mapping 266 (GLY 266)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Engineering and Environmental Geology BSc Engineering and Environmental Geology BSc Geology
Prerequisites	CMY 117, CMY 127, GLY 155, GLY 161, GLY 162, WTW 158 and PHY 114
Contact time	7 days full-time block week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

Introduction to field mapping techniques

Geodynamics and ore formation 352 (GLY 352)

Qualification	Undergraduate
Module credits	18.00
Programmes	BEng Mining Engineering Engage
Prerequisites	GLY 256
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 3

Module content

This module is offered to mining engineering students, and addresses the processes that formed mineral deposits, and the geological approach to exploiting such deposits. The module covers the principles of ore-forming processes and geological environments of ore formation, ore classification schemes, the geometry and geostatistical evaluation of ore bodies, the principles of rock deformation, stress, strain and rheology, joints, fault systems, folds and interference folding, tectonic fabrics, shear zones, and progressive deformation. The practicals cover the identification and classification of ore deposits, and the recognition and mitigation of geologically related mining hazards such as faults, shears and folding.

Engineering geology 363 (GLY 363)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Geology BSc Engineering and Environmental Geology BSc Geology
Prerequisites	GLY 354
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 3

Module content

Definition and scope of engineering geology; engineering geological properties and problems of rocks and soils within different stratigraphic units and climatic regions in southern Africa.

Rock mechanics 364 (GLY 364)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Geology BSc Engineering and Environmental Geology BSc Geology
Prerequisites	GLY 354
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 4

Module content

Strength and failure modes of rock material and rock failure criteria. The characteristics of joints in rock. Joint line surveys and interpretation of data. Characteristics of a rock mass, rock mass classification and determination of strength. Slope stability in surface mines. Induced seismicity due to deep mining and rock bursts.

Structural geology 365 (GLY 365)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	Three of the second-year modules: GLY 255, GLY 261, GLY 262, GLY 253; special exemption is given to 4th-year Mining Engineering students who have completed their required 1st-year Geology modules
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 1

Module content

Integrated theoretical and practical course dealing with the princples of rock deformation and analysis of deformed rocks. Stress, strain and rheology, joints, experimental rock deformation, fault systems and Anderson's theory of faulting. Folds and interference folding, tectonic fabrics, shear zone, prograssive deformation. Stereographic projection and structural analysis.

Groundwater 366 (GLY 366)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	Three of the second-year modules: GLY 255, GLY 261, GLY 262, GLY 253
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Quarter 2

Module content

Origin and classification of groundwater; classification of aquifers; groundwater movement; equations for groundwater flow into boreholes; the La Place equation and solutions for pump tests; execution and interpretation of pump tests; contaminant transport; low temperature aqueous geochemistry; groundwater exploration and management.

Economic geology 367 (GLY 367)

Qualification	Undergraduate
Module credits	36.00
Programmes	BSc Physics BSc Engineering and Environmental Geology BSc Geology BSc Physics
Prerequisites	GLY 365 and GLY 366
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

This module details the genesis and exploitation of major ore deposits, with an emphasis on South African examples. The processes through which ore deposits are formed and modified will be discussed, highlighting the relevance of sedimentary, metamorphic and igneous processes in the genesis of world-class ore bodies. The module will also address the methods of mining commonly used, and the international commodity market, including a brief introduction to ore reserve estimation and the evaluation of potential ore deposits.

Advanced Geological field mapping 368 (GLY 368)

Qualification	Undergraduate
Module credits	6.00

Programmes	BSc Engineering and Environmental Geology BSc Engineering and Environmental Geology BSc Geology
Prerequisites	Three of the second-year modules: GLY 255, GLY 261, GLY 262, GLY 253
Contact time	7 days full-time block week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

Advanced field mapping techniques.

Volcanology 702 (GLY 702)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

This module traces the path of magmas from their ultimate source in the mantle, storage and evolution in the crust, through eruption at the surface where they interact with the landscape and atmosphere. Volcanic eruptions and the transfer of mass and volatiles from the deep interior of the planet. Transformation of the landscape by violent eruptions, and impact on the atmosphere on short timescales. An integrated history of magmatism and its central role in the production of the crust and the degassing history of the planet. The fluid dynamics of volcanoes, from viscous magma flows to turbulent, multiphase eruptions.

Geophysics and basin analysis 703 (GLY 703)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	5 lectures per week, 5 practical sessions per week
Language of tuition	Module is presented in English

Department	Geology
Period of presentation	Year

Module content

Physical properties of rocks and minerals: porosity and permeability; density; magnetic properties; natural radioactivity; elastic properties; seismic wave attenuation; thermal properties; electrical properties. Basic principles and applications of various geophysical techniques: gravity, magnetic, resistivity, electromagnetic, seismic and radiometric techniques. Principles of basin analysis; controls on sea level change; subsurface analytical methods; basin mapping methods; subsidence analysis (decompaction and sediment loading, subsidence curves); sequence stratigraphy; sedimentation systems in different basin types; Precambrian basins.

Crustal evolution 704 (GLY 704)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Precambrian crustal evolution. Precambrian plate tectonics. Precambrian evolution of the African plate (Eburnean, Kibaran and Pan-African events). Phanerozoic evolution to the African plate; global examples of tectonics as a continental crustal source. Determination of deformational history of crustal rocks; determination of palaeostress conditions in ancient crustal rocks. Practical experience of structural analysis and determination of deformational history.

Ore deposits and mining methods 706 (GLY 706)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Systematic review of major metallic and non-metallic ore types and examples in South Africa and world-wide; ore type models (geometry, size, geodynamic setting, grade, chemistry/mineralogy). Controlling legislation and infrastructural requirements for mining. . Mining methods: open cast and underground. Metallurgical treatment, metallurgical plants and waste disposal. Pollution, acid drainage and acid rain.

Mapping camp 707 (GLY 707)

Qualification	Postgraduate
Module credits	9.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Mapping and analysis of a geologically complex area using different techniques.

Honours project 710 (GLY 710)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	5 practical sessions per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Independent acquisition of geological field and/or laboratory data, treatment and interpretation thereof, and writing of an honours essay.

Igneous petrology and geochemistry 711 (GLY 711)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Geology BScHons Geology

Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Interpretation and application of advanced petrogenetic tools: the Rb/Sr and Sm/Ndisotopic systems, quantitative interpretation of binary and ternary phase diagrams, assimilation-fractional crystallisation – partial melting. Abundance of elements in the crust, crust-forming models. Hydrous geochemistry. Recognition of geochemical anomalies. Analytical methods and the treatment of geochemical data.

Metamorphic petrology and geochemistry 712 (GLY 712)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Geothermometers and geobarometers, PT-t loops. Studies of major African and other mobile belts: Limpopo, Natal-Namaqua, Pan-African and Hoggar.

Economic geology 713 (GLY 713)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Geology BScHons Geology
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Basic remote sensing methods and their applications to geology; basic geophysical and geochemical exploration techniques; exploration target generation - philosophies and methods; professional geological practice; the SAMREC and similar codes; geologists in the business environment; case studies. Practical component (runs parallel to theory above) encompasses ore-microscopy; ore mineral identification; ore textures; analysis of ore assemblages; instrumental techniques applied to ores.

Remote sensing 220 (GMA 220)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Geology BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GMC 110
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

This module will provide a thorough introduction to the basic scientific principles involved in remote sensing, and some of the applications to studies of the Earth’s surface. This includes examining the basic physics of electromagnetic radiation and the complex interactions of radiation with the surface and atmosphere (i.e. spectral signatures). In addition, basic concepts of photogrammetry will be discussed. The theoretical background laid out in the first half of the module will provide the tools for examining various remote sensing applications using data obtained in different parts of the electromagnetic spectrum. The applications will include uses of satellite remote sensing data for mapping and monitoring vegetation, soils and minerals, snow and ice, water resources and quality, and urban landscapes. The laboratory section will include hands-on experience with various satellite image data sets.

Remote sensing 320 (GMA 320)

Qualification	Undergraduate
Module credits	22.00

Programmes	BSc Geography BSc Environmental Sciences BSc Geography BSc Geoinformatics BSc Geology BSc Meteorology
Prerequisites	GMA 220
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

This module aims to provide students with a working knowledge and skills to learn methods and techniques for collecting, processing and analysing remotely sensed data. Throughout the module, emphasis will be placed on image processing, image analysis, image classification, remote sensing and applications of remote sensing in geographical analysis and environmental monitoring. The module is composed of lectures, readings, laboratory exercises and research tasks.A project or assignments of at least 64 notional hours.

Advanced remote sensing 705 (GMA 705)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Meteorology BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology
Prerequisites	GMA 320 or equivalent
Contact time	28 contact hours per semester
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

The aim of the module is to provide knowledge and understanding of image analysis and information extraction methods in remote sensing. The emphasis is on equipping students with knowledge and skills necessary to process imagery to extract diverse biophysical and geospatial information. The course gives insight into the possibilities and limitations of the application of modern remote sensing/image acquisition systems for Earth and atmosphere research purposes at different levels of detail.

Cartography 110 (GMC 110)

Qualification	Undergraduate
Module credits	10.00

Programmes	BSc Meteorology BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

History, present and future of cartography. Introductory geodesy: shape of the earth, graticule and grids, datum definition, elementary map projection theory, spherical calculations. Representation of geographical data on maps: Cartographic design, cartographic abstraction, levels of measurement and visual variables. Semiotics for cartography: signs, sign systems, map semantics and syntactics, explicit and implicit meaning of maps (map pragmatics).

Geometrical and space geodesy 310 (GMC 310)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Geography BSc Geography BSc Geoinformatics BSc Meteorology
Prerequisites	GMC 110 and WTW 114/WTW 134
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Spherical trigonometry. Geometrical Geodesy: Datum surfaces and coordinate systems in Geodesy, Calculations on the ellipsoid, Datum transformations. Map projections: Projection principles, distortion determination, construction of conformal, equivalent and equidistant projections, the Transverse Mercator projection and UTM projection of an ellipsoidal earth, projection transformations. Space Geodesy: Time systems, Celestial and observer coordinate systems, Global Navigation Satellite Systems (GNSS), Satellite orbits and orbital parameters, 3¬ D positioning. A project or assignments of at least 64 notional hours.

Geometrical optics 800 (GMO 800)

Qualification	Postgraduate
Module credits	36.00
Programmes	MMed Ophthalmology
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Module content

Mathematical description of waves; Light as an electromagnetic wave; Nature of sources of light; Wave fronts (Huygens principle); Snell's Law; Index of refraction; Exploration of the laws of reflection and refraction at planar and curved surfaces; Ray tracing methodology to find position, Nature of images and magnification; Thin lens formula; Conjugate foci formula; Lensmaker's formula; Ophthalmic prisms: characteristics, classification and refractive power; Thin lenses: types, image formation; Cylindrical lenses: Introduction; Optical Systems: Lens combinations (notation, toric lenses); Thick lenses (cardinal points, system power); The Eye: structure and function, reduced eye; Aberrations in general; Eye defects: myopia, hyperopia, presbyopia, astigmatism; Optical apparatus for ophthalmology: invasive / non-invasive, ophthalmic laser, ophthalmoscope, fundus camera, light coagulator.

Geoinformatics project 320 (GMT 320)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Geography BSc Geography BSc Geoinformatics
Prerequisites	GIS 310 and GIS 311. Only for Geoinformatics students.
Contact time	1 lecture per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

A project which is approved by the lecturer and in which one or more of the studied techniques of data acquisition and processing are used to produce an output of spatially referenced information. The project must be fully described in a project report.

Seminar course 702 (GTK 702)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Genetics BScHons Genetics
Prerequisites	No prerequisites.
Contact time	1 seminar per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Students are guided to collect relevant literature from disparate papers and to condense and collate this into a written seminar. Seminars are presented, along with formal article talks. Themes and articles covered in the course form part of the written examination upon completion of the module.

Research project 703 (GTK 703)

Qualification	Postgraduate
Module credits	60.00
Programmes	BScHons Biotechnology BScHons Biotechnology BScHons Genetics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

A mini-dissertation with well-defined limits is undertaken under the guidance of a supervisor. The students are allowed to choose from a number of projects from the different research programmes in the department. The module also has a strong theoretical component since emphasis is placed on writing and presenting a comprehensive literature review and project proposal. Additional technical and analytical training is provided. The project is concluded with a final report, presented in the format of a short manuscript, as well as a poster and an oral presentation.

Trends in genetics 704 (GTK 704)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Genetics BScHons Genetics
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English

Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Discussions and essays focusing on a selection of advanced topics, as well as recent advances in the field of genetics, with an emphasis on contextualising these developments within the broader framework of the Biosciences and its role in modern society. Ethical and philosophical issues in genetics are debated.

Research methods 705 (GTK 705)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Biotechnology BScHons Biotechnology BScHons Genetics
Prerequisites	No prerequisites.
Contact time	10 discussion classes per week, 5 web-based periods per week, 5 practicals per week, 5 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Students are guided through the methodology of research planning and data handling. They are offered hands-on experience in a range of advanced techniques employed in molecular research and analysis. Scientific writing and presentation skills, required for research in genetics, are also addressed.

Dissertation: Genetics 890 (GTK 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Genetics MSc Biotechnology MSc Genetics MScAgric Genetics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Thesis: Genetics 990 (GTK 990)

Qualification	Postgraduate

Module credits	360.00
Programmes	PhD Biotechnology PhD Biotechnology PhD Genetics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Introductory genetics 161 (GTS 161)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Physics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Extended programme - Biological and Agricultural Sciences BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Veterinary Science
Prerequisites	MLB 111 GS
Contact time	2 lectures per week, fortnightly tutorials
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Chromosomes and cell division. Principles of Mendelian inheritance: locus and alleles, dominance interactions, extensions and modifications of basic principles.. Probability studies. Sex determination and sex linked traits. Pedigree analysis. Genetic linkage and chromosome mapping. Chromosome variation.

Molecular genetics 251 (GTS 251)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Medical Sciences BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	GTS 161 GS
Contact time	fortnightly tutorials, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

The chemical nature of DNA. The processes of DNA replication, transcription, RNA processing, translation. Control of gene expression in prokaryotes and eukaryotes. Recombinant DNA technology and its applications in gene analysis and manipulation.

Genetic diversity and evolution 261 (GTS 261)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Medical Sciences BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	GTS 251 GS
Contact time	2 lectures per week, fortnightly tutorials
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Chromosome structure and transposable elements. Mutation and DNA repair. Genomics and proteomics. Organelle genomes. Introduction to genetic analysis of populations: allele and genotypic frequencies, Hardy Weinberg Law, its extensions and implications for different mating systems. Introduction to quantitative and evolutionary genetics.

Eukaryotic gene control and development 351 (GTS 351)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology

Prerequisites	GTS 251 GS and GTS 261 GS
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Regulation of gene expression in eukaryotes: regulation at the genome, transcription, RNA processing and translation levels. DNA elements and protein factors involved in gene control. The role of chromatin structure and epigenetic changes. Technology and experimental approaches used in studying eukaryotic gene control. Applications of the principles of gene control in eg cell signaling pathways, development cancer and other diseases in humans.

Advanced population genetics 353 (GTS 353)

Qualification	Undergraduate
Module credits	18.00
Prerequisites	GTS 251 GS and GTS 261 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Genetic variation and mating systems. Allele frequency change: genetic drift, natural and kin selection, mutation and migration. Molecular evolution: nucleotide substitutions to multigene families, and the neutral theory. Quantitative genetics: analysis of genetic variation, heritability, natural selection and artificial selection of quantitative traits. Identification of quantitative trait loci (QTLs).

Genome evolution and phylogenetics 354 (GTS 354)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology

Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GTS 251 GS and GTS 261 GS
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Mechanisms involved in the evolution of genes, genomes and phenotypes. Comparison of the molecular organisation of viral, archaea, bacterial and eukaryotic genomes. Genome project design, DNA sequencing methods and annotation. Molecular evolution. Phylogenetic inference. Applications of phylogenetics and evolutionary genomics research, including relevance to sustainable development goals for food security, good health and the biosphere.

Population and evolutionary genetics 367 (GTS 367)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Microbiology BSc Plant Science
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GTS 251 and GTS 261 or permission from HOD.
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Genetic and phenotypic variation. Organisation of genetic variation. Random genetic drift. Mutation and the neutral theory. Darwinian selection. Inbreeding, population subdivision and migration. Evolutionary quantitative genetics. Population genomics. Human population genetics. Levels of selection and individuality. Arms races and irreversibility. Complexity. Applied evolution.

Genetics in human health 368 (GTS 368)

Qualification	Undergraduate

Module credits	18.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology
Prerequisites	GTS 251 and GTS 261 GS
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Application of modern genetics to human variability, health and disease. Molecular origin of Mendelian and multifactorial diseases. The use of polymorphisms, gene mapping, linkage and association studies in medical genetics. Genetic diagnosis: application of cytogenetic, molecular and genomic techniques. Congenital abnormalities, risk assessment and genetic consultation. Prenatal testing, population screening, treatment of genetic diseases and gene-based therapy. Pharmacogenetics and cancer genetics. Ethical aspects in medical genetics.

Site investigation project 713 (GTX 713)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GLY 363/GLY 364 or permission from the HOD.
Contact time	13 practicals per week (11 weeks), 1 lecture per week for 11 wks
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Field work which includes mapping, soil and rock description, joint surveys, borehole testing, water sampling, interpretation of laboratory test results and compilation of site investigation reports. Larger projects of at least two months of fieldwork and report writing which involves surface and underground studies, mapping, drill core logging, discontinuity surveys, rock mass classification, stability analyses, interpretation of laboratory tests or pollution studies including water and/or soil sampling, interpretation of laboratory tests, development of a rehabilitation plan or groundwater model and compilation of a report. Compulsory attendance at conferences, short courses, specialist lectures, visits to construction sites and fields excursions.

Engineering geology of South Africa 714 (GTX 714)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	SGM 311 or permission from the HOD.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Overview of site investigation phases; site investigation techniques; soil profiling and rock core description. Literature study and compilation of reports on the stratigraphy of South African rock types and engineering problems of rocks and soils within different stratigraphic units and climatic regions.

Environmental geochemistry 715 (GTX 715)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Principles of low temperature geochemistry; geochemistry and origin of acid mine water; acid-mineral reactions; industrial effluents, remediation methods, waste disposal, environmental sampling and data analysis; geochemical modelling.

Environmental management and risk assessment 716 (GTX 716)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Meteorology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Principles of integrated environmental management; environmental impact assessment; environmental management systems (ISO 14000 series); water resource management; environmental legislation; site investigation guidelines; natural hazard risk assessment; seismicity; project management and professional business practice.Geological models and software.

Hydrogeological modelling 718 (GTX 718)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Hydrogeology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GTX 725
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Finite-difference methods; numerical solution of the flow and transport equations; spatial and temporal discretisation, stability criteria; development of conceptual models; introduction to PMWIN/Modflow.

Contaminant transport 719 (GTX 719)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Hydrogeology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GTX 715 or permission from the HOD.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Theory of contaminant transport in porous and fractured aquifiers, determination of transport parameters, boundary conditions, analytical solutions of 1-, 2- and 3-dimensional transport equations for porous aquifiers, analytical solutions for fractured aquifiers.

Construction materials 721 (GTX 721)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Requirements for and use of concrete aggregates, road and dam construction materials; site investigation and site development methods; quality control.

Rock engineering 722 (GTX 722)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Hydrogeology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GLY 364 or permission from the HOD.
Contact time	2 lectures per week for 3 weeks, 2 practicals per week (3 weeks)

Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Mapping, description (core logging and discontinuity surveys) and classification of rock masses; engineering properties of rock masses including deformability, shear strength of discontinuities, in situ strength and permeability of rock masses; effects, theoretical derivation and practical measurements of in situ stresses.

Engineering applications 723 (GTX 723)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology
Prerequisites	GTX 722
Contact time	2 lectures per week for 3 weeks, 2 practicals per week (3 weeks)
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

The influence of geology on construction projects with specific reference to the requirements of dams, tunnels, slopes, waste disposal and urban development.

Fluid mechanics in geological media 725 (GTX 725)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GLY 363 and GLY 265
Contact time	2 lectures per week for 3 weeks, 2 practicals per week (3 weeks)
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Statics and dynamics of fluids, including water, aqueous phase liquids (saline water), non-aqueous phase liquids (petroleum hydrocarbons), gases (atmospheric air) and man-made fluids (gout) through natural and man-made porous media (eg soil, rock, concrete). Single phase flow and multiphase flow; saturated and unsaturated flow. Quantification of hydrological parameters. South African hydrostratigraphy. Drainage and dewatering.

Rock and soil improvement 726 (GTX 726)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Engineering Geology BScHons Engineering and Environmental Geology Hydrogeology
Prerequisites	GLY 264 or permission from the HOD.
Contact time	2 lectures per week for 3 weeks, 2 practicals per week (3 weeks)
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Grouting materials and procedures; rock and soil support and stabilisation; rock and soil compaction; geofabrics; water seepage and drainage methods.

Dissertation: Hydrogeology 890 (GTX 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Engineering and Environmental Geology Hydrogeology MSc Engineering and Environmental Geology Hydrogeology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Thesis: Hydrogeology 990 (GTX 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Engineering and Environmental Geology Hydrogeology PhD Engineering and Environmental Geology Hydrogeology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English

Department	Geology
Period of presentation	Year

Large stock nutrition and production 420 (GVK 420)

Qualification	Undergraduate
Module credits	18.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	RPL 320, VGE 320, VKU 250 and VKU 260
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Production management of large stock. Aspects of business management of the large-stock enterprise. Management programmes, production sytems and techniques applicable to beef cattle, dairy cattle and horses. Specialised nutrition of beef and dairy cattle according to production systems. The use of computer systems in feeding management. Design and planning of farm buildings and structures. Storage and handling of fodder. The handling and management of refuse. Hygiene and herd health programmes. Practical work: This will include compiling rations based on requirements and least cost formulations, specialised assignments and on-farm experiential training.

Large stock science 800 (GVK 800)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Management programmes and systems for beef cattle, dairy cattle and horses. Optimal use of breeds and regional adaptation of cattle. The stud industry and commercial units. Indigenous breeds and production development. The application of animal science practices and the practise of techniques for breed improvement. Seminars, class discussions, literature studies and assignments on certain fields. Research and production techniques. Agro-economic, agro-ecological and socio-economic assignments can be prescribed.

Human nutrition 210 (HNT 210)

Qualification	Undergraduate
Module credits	27.00
Programmes	BSc Nutrition BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	2nd-year status
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 1

Module content

Application of scientific principles in human nutrition.
Standards, guidelines and food composition tables.

Human nutrition 220 (HNT 220)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Nutrition BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FLG 211 GS FLG 212 GS BCM 253 BCM 254 BCM 255 BCM 256 VDG 250 HNT 210
Contact time	3 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 2

Module content

Human nutrition in the life cycle: Nutritional screening, nutritional needs, nutrition problems and prevention thereof, growth monitoring and meal/menu planning.

Advanced human nutrition 411 (HNT 411)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Nutrition BSc Nutrition
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	4th-year status

Contact time	1 discussion class per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 1

Module content

Seminars and case studies (theory and practical application): Eating behaviour, eating disorders, nutrient/nutrition supplementation, sports nutrition, vegetarianism, food safety, nutrition of the disabled, prevention of non-communicable disease of lifestyle; nutrition and immunity; nutrition and genetics.

Principles and practices 351 (HSC 351)

Qualification	Undergraduate
Module credits	14.00
Programmes	BScAgric Plant Pathology BScAgric Agricultural Economics and Agribusiness Management BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	No prerequisites.
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The organised nursery industry in South Africa. Principles: seed production; seed germination; rooting of cuttings; budding and grafting; propagation using specialised organs; micro propagation (tissue culturing). Practices: Greenhouse construction, lighting in the nursery; cooling and heating; soil-based and soil-less growing media; container types; irrigation and fertilisation; growth manipulation; pest and disease management. Management, economic and marketing aspects of a typical nursery operation. Students will get hands-on experience and will visit nurseries.

Fruit tree crops 420 (HSC 420)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250 and PGW 350
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences

Period of presentation	Semester 2

Module content

Crop modelling, climate zones, climate requirements, cultivation regions, economic importance, anatomy and morphology, phenological modelling. Commercially important scions, rootstocks and their interactions. Crop management including fertilization, irrigation, pest and disease complex, tree and fruit manipulation, physiological disorders of economically important tropical, subtropical and temperate fruit crops produced in Southern Africa.

Ornamental horticulture 490 (HSC 490)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	No prerequisites.
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Economic importance of cut flowers, ornamentals and turfgrass. Taxonomy and plant description. Climatic requirements and production practices including establishing, growth manipulation, nutritional requirements, irrigation, pest and disease control, harvest and post-harvest handling. Identification of ornamental plants for commercial and landscape use. Climatic, reproduction and maintenance requirements for trees, palms, cycads, shrubs, flowering plants, ground covers, turfgrass, climbers and indoor plants. Functional and aesthetic value of plants in a landscape or indoors. Excursions to nurseries and practical experience on the experimental farm is compulsory for all participants in this module.

Fruit tree crops 780 (HSC 780)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

An overview of the South African fruit industry indicating economic importance and the areas of production of the various crops. Principles governing orchard establishment and orchard management, including location and site selection, crop and cultivar choices, site preparation, orchard layout and design, irrigation, fertilisation, pruning and training, the application of plant growth regulators and disease and pest management. Harvesting practices and the post-harvest physiology of fruit which determines storage protocols and the quality of the fruit reaching the consumer. Climatic requirements, phenological models, cultivars and rootstocks, fruit manipulation, physiological disorders and pest and disease complexes of subtropical and deciduous fruit crops produced in South Africa.

Advanced coursework 801 (HSC 801)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Contact time	1 seminar per week, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Any module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

Mini-dissertation: Horticultural science 891 (HSC 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Each candidate must write a mini-dissertation on his/her research project in Horticulture and at least prepare a concept research paper for publication in a peer-reviewed scientific journal.

Actuarial and Financial Mathematics in practice 111 (IAS 111)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics

Prerequisites	At least 6 (70-79%) in Mathematics and a APS score of 32 in the Grade 12 examination or WTW 133 (60%), WTW 143 (60%), WST 133 (60%) and WST 143 (60%).
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 1

Module content

Professionalism, working in multicultural environments, self-development, propositional logic, financial needs.

Actuarial and Financial Mathematics in practice 121 (IAS 121)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Prerequisites	WTW 114 or WTW 153, WST 111 or WST 153, IAS 111.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

Financial service providers, investment examples including an introduction to mathematics of finance, life insurance examples including an introduction to contingencies, general insurance examples including an introduction to reserving using run-off triangles, personal self-development.

Financial mathematics 211 (IAS 211)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	IAS 111, IAS 121, WTW 114, WTW 123, WTW 124, WTW 152, WST 111, WST 121
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science

Period of presentation	Semester 1

Module content

Principles of actuarial modelling, cash-flow models, the time value of money, interest rates, discounting and accumulating, level annuities, deferred and increasing annuities, equations of value.

Contingencies 221 (IAS 221)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Prerequisites	IAS 211
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

Fundamentals of survival models, select and ultimate life tables, Assurance and annuity functions, basic calculation of premiums and reserves, principles of pricing and reserving.

Financial mathematics 282 (IAS 282)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	IAS 211
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

Principles of actuarial modelling, cash-flow models, the time value of money, interest rates, discounting and accumulating, level annuities, deferred and increasing annuities, equations of value, loan schedules, project appraisal, elementary compound interest problems, term structure of interest rates.

Contingencies 353 (IAS 353)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics
Prerequisites	IAS 382, WST 312
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

Annuities and assurances involving one or two lives, life tables, Calculating premiums and reserves allowing for fixed or variable benefits and premiums, competing risks, profit testing.

Insurance and actuarial applications 361 (IAS 361)

Qualification	Undergraduate
Module credits	18.00
Prerequisites	IAS 211 and IAS 221
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 1

Module content

Risk and insurance. Stakeholders and the external environment. Professionalism. Actuaries and the regulatory environment. Insurance products and their providers. Pricing of insurance products. Wider fields of actuarial practice. Reinsurance. New developments in the industry.

Survival models 382 (IAS 382)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	IAS 221 60%, IAS 282 60%, WST 211, WST 221, WTW 211, WTW 218
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English

Department	Actuarial Science
Period of presentation	Semester 1

Module content

Survival models and the life table, estimating the lifetime distribution, proportional hazard models, the binomial and Poisson models, exposed to risk, graduation and statistical tests, methods of graduation.

Actuarial risk management 712 (IAS 712)

Qualification	Postgraduate
Module credits	50.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Year

Module content

Surplus management. Mergers, acquisitions, insolvency and closure. Options and guarantees. Stakeholders. External environment. Regulation. Introduction to financial products and customer needs. Benefits overview and providers of benefits. Life insurance overview and life products. General insurance overview and products. Cash flows of simple products. Contract design. Project management. Capital project appraisal. Money markets. Bond markets. Equity markets. Property markets. Futures and options. Collective investment schemes. Overseas markets. Economic influences on investment markets. Other influences on investment markets. Relationship between returns on asset classes. Valuation of individual investments. Valuation of asset classes and portfolios. Investment strategy – institutions. Investment strategy – individuals. Developing an investment strategy. Modelling. Data. Setting assumptions. Expenses. Pricing and financing strategies. Discontinuance. Valuing liabilities. Accounting and disclosure. Surplus and surplus management. Sources of risk. Risks in benefit schemes. Pricing and insuring risks. The risk Management process. Risk management tools. Capital management. Monitoring.

Enterprise risk management 721 (IAS 721)

Qualification	Postgraduate
Module credits	40.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content
ERM framework. External risk frameworks. Stakeholders. Risk appetite. The risk management function. Risk management processes. Risk identification and assessment. Risk classification. Risk Measurement. Risk modelling. Analysis of data. Copulas. Fitting models. Extreme Value Theory. The use of models in ERM. Analysis of selected risks. Risk optimisation and risk responses. Risk management of selected risks. Economic Capital.

Actuarial communication 722 (IAS 722)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content
Communicating technical actuarial concepts effectively, the drafting process of a document, planning and structure of a document or presentation, style and tone of a document or presentation. Drafting documents (letters, reports, discussion documents, memos, emails). Presentations (preparation and delivery, follow up, designing visual aids).

Engineering geology 703 (IGL 703)

Qualification	Postgraduate
Module credits	16.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	20 Contact hours
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Engineering geology 704 (IGL 704)

Qualification	Postgraduate
Module credits	16.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.

Contact time	10 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Dissertation: Engineering Geology 890 (IGL 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Engineering and Environmental Geology MSc Engineering Geology MSc Engineering and Environmental Geology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Thesis: Engineering geology 990 (IGL 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Engineering and Environmental Geology PhD Engineering Geology PhD Engineering and Environmental Geology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Informatics 112 (INF 112)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Physical Sciences BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination; or STK 113 60%, STK 123 60% or STK 110
Contact time	2 lectures per week

Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

Introduction to information systems, information systems in organisations, hardware: input, processing, output, software: systems and application software, organisation of data and information, telecommunications and networks, the Internet and Intranet. Transaction processing systems, management information systems, decision support systems, information systems in business and society, systems analysis, systems design, implementation, maintenance and revision.

Informatics 154 (INF 154)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Geography BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination
Contact time	2 practicals per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 1

Module content

Introduction to programming.

Informatics 164 (INF 164)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Geography BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	INF 154; A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination; AIM 101 or AIM 102 or AIM 111 and AIM 121

Contact time	2 practicals per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

Programming.

Informatics 171 (INF 171)

Qualification	Undergraduate
Module credits	20.00
Programmes	BSc Geography BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	A candidate must have passed Mathematics with at least 4 (50-59%) in the Grade 12 examination
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Year

Module content

General systems theory, creative problem solving, soft systems methodology. The systems analyst, systems development building blocks, systems development, systems analysis methods, process modelling.

Informatics 214 (INF 214)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Environmental Sciences BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	AIM 101 or AIM 111 and AIM 121
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English

Department	Informatics
Period of presentation	Semester 1

Module content

Database design: the relational model, structured query language (SQL), entity relationship modelling, normalisation, database development life cycle; practical introduction to database design. Databases: advanced entity relationship modelling and normalisation, object-oriented databases, database development life cycle, advanced practical database design.

Informatics 225 (INF 225)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	INF 112; AIM 101 or AIM 102 or AIM 111 and AIM 121
Contact time	3 practicals per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

An overview of systems infrastructure and integration.

Informatics 261 (INF 261)

Qualification	Undergraduate
Module credits	7.00
Programmes	BSc Geography BSc Geography BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
Prerequisites	INF 214
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

Database management: transaction management, concurrent processes, recovery, database administration: new developments: distributed databases, client-server databases: practical implementation of databases.

Informatics 272 (INF 272)

Qualification	Undergraduate
Module credits	14.00
Programmes	BIS Information Science
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
Prerequisites	AIM 101 or AIM 102 or AIM 111 and AIM 121, INF 164 and INF 171, Regulation IT.3(g)
Contact time	1 lecture per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Year

Module content

Advanced programming.

Informatics 282 (INF 282)

Qualification	Undergraduate
Module credits	3.00
Programmes	BCom Statistics BConSci Clothing Retail Management BConSci Food Retail Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
Prerequisites	FRK 111, FRK 121 or FRK 100 or FRK 101
Contact time	2 practicals per week
Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 1 and Semester 2

Module content

Computer processing of accounting information.

Systems thinking and engineering 780 (ISE 780)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	20 contact hours per semester
Language of tuition	Module is presented in English
Department	Engineering and Technology Management
Period of presentation	Semester 1 and Semester 2

Module content

A company's ability to remain competitive in modern times hinges increasingly on its ability to perform systems engineering. The technology and complexity of a company's products appears to steadily increase and with it, the risks that need to be managed. This module provides specialised knowledge to apply systems engineering by understanding the tools, processes and management fundamentals.

Interior merchandise 121 (ITW 121)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer Science
Period of presentation	Semester 2

Module content

Household material and equipment studies: Metals and non-metals used for the manufacturing of objects, equipment and components of appliances for household use. Study and evaluation of selected non-electrical household equipment in terms of specific end-use situations.

Costume and fashion history 210 (KLD 210)

Qualification	Undergraduate
Module credits	12.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	No prerequisites.
Contact time	3 lectures per week

Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Costume and fashion history: Appearance characteristics of Western dress. Influencing factors. Evolution of styles from Ancient Egyptian up to and including the present.

Fashion forecasting 222 (KLD 222)

Qualification	Undergraduate
Module credits	12.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

The South African fashion industry: Basic principles of fashion; fashion as a product; and the consumer. Fashion production: Haute Couture and ready-to-wear clothes. Fashion forecasting and fashion analyses.

Social and cultural aspects of clothing 311 (KLD 311)

Qualification	Undergraduate
Module credits	15.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Social-Psychological and cultural aspects of clothing: Development of a framework; Symbolic-Interaction as a framework; the cognitive approach. Development of the self: self and self-concept: the body as indicator; personal values and norms. Appearance management and presentation of the self: role acceptance, identity, social control, roles in social cognition. Cultural context and dress: reflection of human adaptation; culture creations (technical, moral and ceremonial patterns); societies and clothing; beauty standards and beauty ideals.
Social context, identity, change and clothing: the family, politics, religion, economy and the role of clothing as a reflection of social and personal identities; mentefacts and identities; social change and clothing

Clothing retail management 410 (KLD 410)

Qualification	Undergraduate
Module credits	20.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	Final-year status
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Clothing retail aspects: Functioning of clothing retail. Environments, formats and structures of clothing retailers. Merchandising and store positioning. Fashion consumer behaviour. Ethics and social responsibilities of clothing retailers. Fashion marketing communication; advertising, direct marketing, sales promotions, personal selling and service provision, publicity and public relations, fashion shows and special events.

Clothing merchandising 420 (KLD 420)

Qualification	Undergraduate
Module credits	20.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	Final-year status
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Clothing merchandise managerial aspects: fashion buying and planning function, controlling inventories, factors influencing stock movement, redistribution of stock; merchandising processes, sourcing and relationship with suppliers; management roles and responsibilities. Buying strategies, forecasting and records, preparing a buying plan, developing an assortment plan. Use of relevant soft wear in the buying and planning function. Global perspective of the clothing industry.

Clothing production: sewing techniques 110 (KLR 110)

Qualification	Undergraduate
Module credits	9.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Basic clothing construction techniques and quality control.

Clothing production: processes 120 (KLR 120)

Qualification	Undergraduate
Module credits	9.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	KLR 110
Contact time	1 discussion class per week, 1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Application of basic clothing construction techniques and quality control.

Flat pattern design 211 (KLR 211)

Qualification	Undergraduate
Module credits	12.00

Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	KLR 120
Contact time	2 practicals per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Flat pattern design. Computer Aided Design (CAD).

Pattern use and good fit 221 (KLR 221)

Qualification	Undergraduate
Module credits	10.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	KLR 211
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Pattern use and good fitting.

Clothing production 321 (KLR 321)

Qualification	Undergraduate
Module credits	17.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	KLR 221
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Small scale production: Industrial machines, production systems, quality assurance.

Product development 411 (KLR 411)

Qualification	Undergraduate
Module credits	19.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	KLR 221 and KLR 321
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Production: product analysis, planning and execution. Application clothing, textile and consumer knowledge by utilising a CAD-program for planning and assembling apparel. The small business enterprise: Introduction: clothing small business enterprises; types and locations. Marketing aspects: target market selection; product mix; pricing methods; distribution channels; marketing communication mix; financial aspects.

Experiential training in industry 403 (KTP 403)

Qualification	Undergraduate
Module credits	5.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	Documentation of work experience as required for years 1-3
Contact time	1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

During the first to fourth years of study students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of department. These "credits" include evidence of experiential training, service learning and community engagment during the four years of the study programme and must be successfully completed together with a complete portfolio before the degree will be conferred

Small stock nutrition and production 420 (KVK 420)

Qualification	Undergraduate
Module credits	18.00

Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	RPL 320, VGE 320, VKU 250 and VKU 260
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Specialised small stock and game nutrition. Principles of creep feeding, drought feeding, winter and supplementary feeding. Feeding pen nutrition and final nutritional preparation of lambs. Influence of nutrition on wool, pelts and mohair. Fodder-flow planning. Small stock management, making arrangements for shearing and prepararing sheds and equipment, pens, dipping, drinking and feeding facilities. Preparation and marketing of hides, wool, mohair and karakul. Lambing seasons and herd management. Management programmes for the production of wool, meat, karakul pelt and mohair according to the particular ecological region and for conditions of drought. Herd health programmes. Practical work: Formulation of lowest cost rations and practical work with small ruminants.

Small stock science 800 (KVK 800)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Advanced aspects of the small stock industry. The wool, fur and meat production potential of South Africa. Production trends and factors influencing them. Production systems. The influence of flock composition on production. Discussions, seminars and prescribed scientific literature studies on various aspects of the small stock industry.

Land development 990 (LDV 990)

Qualification	Postgraduate
Module credits	360.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Introduction to agricultural economics 210 (LEK 210)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Environmental Sciences BSc Environmental Sciences BSc Food Science BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Introduction to financial management in agriculture: Farm management and agricultural finance, farm management information; analysis and interpretation of farm financial statements; risk and farm planning. Budgets: partial, break-even, enterprise, total, cash flow and capital budgets. Time value of money. Introduction to production and resource use: the agricultural production function, total physical product curve, marginal physical product curve, average physical product curve, stages of production. Assessing short-term business costs; Economics of short-term decisions. Economics of input substitution: Least-cost use of inputs for a given output, short-term least-cost input use, effects of input price changes. Least-cost input use for a given budget. Economics of product substitution. Product combinations for maximum profit. Economics of crop and animal production.

Agricultural economics 220 (LEK 220)

Qualification	Undergraduate
Module credits	12.00
Programmes	BCom Statistics BSc Food Science BScAgric Agricultural Economics and Agribusiness Management BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Economic and Management Sciences
Prerequisites	[LEK 210] or [EKN 113 and/or EKN 120]
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Agricultural Economics Extension and Rural Develo

Period of presentation	Semester 2

Module content

The agribusiness system; the unique characteristics of agricultural products; marketing functions and costs; market structure; historical evolution of agricultural marketing in South Africa. Marketing environment and price analysis in agriculture: Introduction to supply and demand analysis.
Marketing plan and strategies for agricultural commodities; market analysis; product management; distribution channels for agricultural commodities, the agricultural supply chain, the agricultural futures market.

Agricultural economics 310 (LEK 310)

Qualification	Undergraduate
Module credits	12.00
Programmes	BCom Statistics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	[LEK 210 or EKN 110] and [EKN 120]
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Historical evolution of South African agricultural policy. Agriculture and the state: reasons for government intervention. Theoretical aspects of agricultural policy. Introduction to agricultural policy analysis. Welfare principles, pareto optimality. Macroeconomic policy and the agricultural sector. International agricultural trade.

Agricultural economics 320 (LEK 320)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom Statistics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	LEK 220, LEK 210
Contact time	3 lectures per week, 2 practicals per week
Language of tuition	Afrikaans and English are used in one class
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

The modern food and agribusiness system. Key drivers in the global context. Whole farm planning and budget development The financial analysis of farm financial, financial modelling, the financing decision: capital acquisition, creditworthiness, different capital sources, capital structures. The investment decision and working capital management. Value chains in agribusiness. Risk management. Strategic management and marketing principles in agribusiness. Operational management and human resources management. Business planning for agribusiness.

Agricultural market and price analysis 410 (LEK 410)

Qualification	Undergraduate
Module credits	20.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	LEK 220 and LEK 210
Contact time	2 practicals per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

This module will focus on the fundamentals of demand, supply and agricultural price analysis. After providing an appropriate background in the theoretical concepts of demand and supply these basics will be applied in the generation of econometric simulation models. This will include the identification of supply and demand shifters as well as the elasticities, flexibilities, and impact multipliers. Practical experience in the formulation of these models will be attained from practical sessions. The student will submit a project in which he/she must analyse the demand or supply patterns of a commodity of his/her choice by generating an econometric model. Agricultural price analysis: price determination under different market structures followed by practical sessions on measuring market structures in various ways. This will include the calculation of market concentration. Price trend analysis and measurement of price changes by using indexes, and especially seasonal indexing. All of this will be supported by the relevant practical sessions.

Agricultural economics 415 (LEK 415)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	EKN 110, LEK 220 and WTW 134 or WTW 165
Contact time	1 practical per week, 3 lectures per week

Language of tuition	Separate classes for Afrikaans and English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Derivative instruments in agriculture: To prepare students for taking the SAFEX Agricultural Markets Division brokerage exam. Giving an in-depth knowledge on the importance of hedging. Giving an in-depth knowledge on designing and implementation of low/zero risk hedging strategies. Introduction to the mathematics of portfolio management and mathematical modelling of derivatives. Working knowledge of the mathematical relationships in the management of a hedged portfolio. Working knowledge on the applicable software for managing derivative portfolios. Introduction into the management of option portfolios. To expand the thinking on the uses of derivatives, by also dealing with the hedging of diesel cost, interest rates and weather events.

Agricultural economics 421 (LEK 421)

Qualification	Undergraduate
Module credits	20.00
Programmes	BCom Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	LEK 410 and STK 210
Contact time	3 lectures per week, 2 practicals per week
Language of tuition	Separate classes for Afrikaans and English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Price and production function analysis. Input -output, input -input and product -product relationships; profit maximization; the production process through time, economies of size; decision making in agriculture under risk and uncertain circumstances; linear programming.

Introduction to resource economics 424 (LEK 424)

Qualification	Undergraduate
Module credits	15.00
Programmes	BCom Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Economic and Management Sciences
Prerequisites	LEK 210
Contact time	3 lectures per week
Language of tuition	Module is presented in English

Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

This module reviews the origins and evolution of natural and environmental resource economics and its present-day main paradigms. Sources of externalities and causes of environmental degradation are examined. An introduction to the concepts and methods backing the design and implementation of environmental policies are provided. Economic valuation of natural and environmental resources is introduced.

Advanced production economics 711 (LEK 711)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Prerequisites	EKT 713 and MIE 780
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Advanced production economics
(a) Primal approach: Structure of the production technology and properties, elasticity of substitution, homogeneity and returns to scale, separability, estimation of technology parameters and testing hypothesis about properties, functional forms.
(b) Normative supply analysis: Applications of linear programming to farm supply decisions.
(c) Dual approach: The profit function, the cost function, duality and technology structure, estimation and hypothesis testing.
(d) Positive supply analysis: Econometric specification of output supply and factor demand, restrictions from technology structure (homogeneity, etc.), aggregate supply analysis.
(e) Risk and uncertainty: Mean-variance analysis applications in agricultural production, stochastic dominance; MOTAD and quadratic programming.

Agricultural marketing 713 (LEK 713)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English

Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

Agricultural marketing. The nature, development and conceptualisation of marketing and marketing study; the marketing environment, nationally and internationally; the functional and institutional approaches to marketing study; price discovery and margins; dynamics of agricultural and food marketing channels; competition and concentration on horizontal and vertical level; conflict and power relationships in agricultural marketing; economics of food consumption, consumer behaviour and consumer action; food market segmentation; food quality and branding, price, product, promotional and distributional policy; marketing analysis and planning. Global food marketing issues, contracting and changing global food retail patterns.

Agribusiness management 720 (LEK 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BAgricHons Rural Development BAgricHons Rural Development
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

Strategic management in agriculture. Dynamics of agricultural management. Entrepreneurship. Environmental scanning. Productivity measurement and improvement thereof by the organisation of manpower, capital and financial sources. Business growth. Formulation and implementation of competitive strategy. Corporate governance, strategic analysis and strategic choice, strategy implementation, balanced scorecard.

Agricultural finance and risk management 722 (LEK 722)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Agricultural finance. Economic theory underlying agricultural finance and agricultural finance institutions. Supply and demand of agricultural financial services. Servicing the farm and the agricultural business firm. Agricultural finance within the broader financial market in South and Southern Africa. Risk assessment and management. Risk in agricultural finance and mitigation strategies.

Agribusiness research report: Case study 777 (LEK 777)

Qualification	Postgraduate
Module credits	30.00
Programmes	BComHons Agricultural Economics
Service modules	Faculty of Economic and Management Sciences
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Module content

In this module students have to select a specific agribusiness and analyse one key dimension of this business. This dimension could be: marketing programme, supply chain management, strategic plan, market analyses, etc. This component of the course should serve as an opportunity for students to identify prevalent problems in an agribusiness and to devise appropriate solutions. This module should have a practical onslaught with a case study approach. It is envisaged that the student will have to work in close cooperation with companies and professionals in the industry, with the written report as the final deliverable of the the case study.

International agricultural trade and policy 782 (LEK 782)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

WTO/GATT-1994 and agricultural related Agreements and Understandings. Regionalism and trade blocks. International trade and economic development. South Africa's agricultural trade policy. Involvement in bilateral and plurilateral agreements. Application of international market analysis tools. International trade and tariff statistics, trade modelling, theory and familiarity in international and regional databases. The module covers the basic tools to understand what determines the flow of goods across countries, i.e. international trade, and applications to a number of topics of current interest, including the debate on globalisation, free trade agreements, the SA Current account and the medium run prospects for exchange rates.

Advanced rural finance 784 (LEK 784)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Advanced rural finance. Economic theory underlying rural financial markets and institutions. Economic growth and financial services. Supply and demand of financial services in rural areas. Rural financial institutions and application to South and Southern Africa.

Agricultural project planning and appraisal 785 (LEK 785)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics BAgricHons Rural Development
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

a) Project planning and priority setting (project concept to rural socioeconomic development, logical framework analysis, research priority setting methods, strategic planning, scenario planning).
b) Economic analysis of agricultural development projects through CBA (decision making in public and private sectors, financial, social and economic considerations; identification of Cs and Bs, valuation of Cs and Bs; project assessment criteria.
c) Monitoring, evaluation and impact assessment (process and program monitoring, MandE systems; causality, incrementality and the attribution problem; impacts assessment methodology.
d) Project management (scheduling, techniques for management, managing risk and uncertainty, monitoring performance
e) Welfare economics and political economy considerations (Pareto optimality, compensation tests, efficiency and distribution, politics of CBA, development projects vs. development policies, first vs. second best shadow prices, market failure)

Agricultural supply chain management 788 (LEK 788)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Agricultural Economics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

Agricultural supply chain analysis. Explore the evolution of supply chain management in the global food industry. Establish the different ways in which supply chain management can provide a source of competitive advantage at industry level and for individual firms. Examine the crossfunctional and multidisciplinary nature of supply chain management as it applies in the global food industry. Introduce the core elements of the theoretical literature on supply chain management and consider applications in different sectors. Provide students with practical experience in applying the principles of supply chain management to the exploitation of a marketing opportunity, using case examples from the fresh produce and meat sectors. Provide students with practical experience of undertaking a supply chain audit, with a view to establishing an appropriate business strategy for a food manufacturing company.

Agricultural economics 800 (LEK 800)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Applied econometrics 810 (LEK 810)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework) MScAgric Agricultural Economics (Coursework)
Prerequisites	No prerequisite.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English

Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

Econometrics. Linear regression: assumptions of the linear regression model, OLS estimators and properties, hypothesis testing (single and multiple restrictions), forecasting, dummy variables. Violations of the linear model assumptions: multi-colinearity, heteroscedasticity, serial correlation and distributed lag models, (GLS estimators). Advanced topics: Quantitative response models (logit, tobit and probit analysis) co-integration, instrumental variables and 2-stage least squares.

Production economics 811 (LEK 811)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework) MScAgric Agricultural Economics (Coursework)
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

This module follows on the final-year module LEK 421 and is taught at the intermediate level and now moves beyond the single input production function to analysis with multi-variable functions. Detailed exposure to production, cost and profit functions, and the duality that exists between these is a core element of the module. The focus will also be on the implications of the properties for the economic behavior of agents. At the end of this module students will have complete competence in algebraically solving for the cost minimisation and profit maximisation problems. Themes covered in the module are: Properties of production functions. Economic theory of cost. Economic Theory of Profits. Duality between the cost and production functions. Duality between the profit and production functions. Applied topics.

Agricultural policy analysis 812 (LEK 812)

Qualification	Postgraduate
Module credits	15.00
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Agricultural policy analysis. The importance and place of agricultural policy. Policy incidence. Design of agricultural policy Instruments. Public choice theory and agricultural policy. Political economy of agricultural policy. Agricultural policy distortions. The role of the media in agricultural and food policy. Seminars.

Quantitative methods for agricultural and environmental policy 814 (LEK 814)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Quantitative models for agricultural and environmental policy. This module will introduce students to applications of discrete choice and linear regression models to agricultural and environmental economics. These include demand systems, production functions and treatment effects/impact assessment models. The second part of the class will focus on mathematical programming and numerical methods including but not limited to multisector models, Input-output and programming models and social accounting matrices for consistent production planning, growth, income distribution and trade policy analysis. Computable general equilibrium models.

Applied micro-economics 815 (LEK 815)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework) MScAgric Agricultural Economics (Coursework)
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Economic models and empirical applications in food demand and agricultural production, welfare economics, risk analysis, and industrial organisation as it relates to the agricultural and food industry.

Partial equilibrium modelling and commodity market analysis 820 (LEK 820)

Qualification	Postgraduate
Module credits	15.00
Programmes	MPhil Agricultural Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	EKT 723 or LEK 810
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

This module focuses on the modelling of agricultural commodity markets, price determination, policy and trade. The main objective is to provide the basic theoretical principles and skills for partial-equilibrium model building and and opportunity to apply these skills. The approach will include:
1) Economic theory: The theoretical foundations of each modelling component of a typical commodity balance sheet and set of prices will be emphasised in the design and specification of models; price formation and model closure under alternative equilibrium pricing conditions
2) Applied research: Advanced steps in modelling will be emphasised. Throughout the module, applied modelling research will be conducted and presented to gain experience with methods discussed in class. The course applies economic theory and quantitative methods to analyse food and agricultural markets, price, trade and policy issues. The module examines problem formulation, model structure, estimation, and model evaluation applied to demand and supply and to trade and policy interventions.

Environmental valuation and policy 826 (LEK 826)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Management (Coursework) MSc Environmental Economics (Coursework) MSc Environmental Management (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo

Period of presentation	Semester 2

Module content

Environmental valuation and policy. This module will review the basic principles of microeconomic theory needed for understanding and analysis of environmental problems, introduce market and non-market techniques of valuation of natural resources and environmental services (hedonic pricing, contingent valuation, transport cost, willingness-to-pay, cost-based techniques, etc.), public goods and environmental externalities, property rights regimes and selection of appropriate environmental policy instruments for management of environmental externalities.

International agricultural trade and policy 827 (LEK 827)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

WTO/GATT-1994 and agricultural-related agreements and understandings. Regionalism and trade blocks. International trade and economic development. South Africa’s agricultural trade policy. Involvement in bilateral and multilateral agreements. Application of international market analysis tools. International agricultural trade and tariff statistics, trade modeling, theory and familiarity in international and regional databases. The module covers the basic tools to understand what determines the flow of agricultural goods across countries, i.e. international trade, and applications to a number of topics of current interest, including the debate on globalisation, free trade agreements, the SA Current account and the medium run prospects for exchange rates.

Forest resource economics and policy 831 (LEK 831)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Forest Management and the Environment (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

The economics of optimal management of cultivated and natural forests. Optimal rotation age and harvesting in timber production. Managing forest for their non-timber services. The multiple ecosystem services of forest and their contributions to human wellbeing. Economic valuation of the services of forest ecosystems. Forest resource rents and their capture and distribution under different property rights regimes. Regulation and taxation of forest users. Designing logging concessions and forest exploitation policies. Forest resource accounting and optimal management of the resource rents. Communities and forests. Case study examples from Sub-Saharan Africa.

Agricultural science and technology policy 832 (LEK 832)

Qualification	Postgraduate
Module credits	15.00
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Registration for at least a master's degree
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

The basic definitions and concepts related to agricultural science policy. An overview of the trends in research investment, capacity development in the field of agricultural research, juxtaposed against the regional and international performance in this field. The application of concepts and methodologies used in project planning and management with respect to research evaluation and monitoring. Productivity analysis and its use in evaluating technological change, the determination of the RandD effects in terms of agricultural research and development. Case studies dealing with current topics in agricultural science policy highlighting the application of the methodologies learned.

Food policy 833 (LEK 833)

Qualification	Postgraduate
Module credits	15.00
Programmes	MAgric Rural Development MAgric Rural Development
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Registration for at least a master's degree
Contact time	1 practical per week, 1 lecture per week, 1 seminar per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

The concept and interrelated causes of food insecurity (production, markets and socio-economic climate) and the global food economy. Household coping strategies and response to risk and shocks. Household dynamics (including livelihoods, purchasing behaviour and nutrition). Practical tools for programme and policy analysis and targeting. Evaluation of possible programme and policy options and their effectiveness in terms of achieving comprehensive and pro-poor growth.

Measuring and monitoring food security 834 (LEK 834)

Qualification	Postgraduate
Module credits	15.00
Programmes	MAgric Rural Development MAgric Rural Development
Prerequisites	Registration for at least a master's degree
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Indicators, scores, indexes, measurement approaches, systems and analysis methods, for food security monitoring and evaluation. Best practice for surveys and qualitative methodologies. Communicating research results and food security information for decision makers. The data included in the module will cover agricultural crop and livestock, food stocks, nutrition, health, agrometerological, behavioural and sanitation related information.

Natural resource and environmental economics 880 (LEK 880)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework)
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Natural resource and environmental economics. This module reviews the origins and evolution of natural and environmental resource economics. It describes and studies the application of economic principles and analytical methods for sustainable development of renewable, non-renewable and environmental economics. Examine sources of inefficiency and causes as well as indicators of environmental degradation. The economics of pollution management: Concepts, policies and instruments. Sustainable management of natural and environmental resources. Introduction to natural and environmental resource policy. Economic valuation of natural and environmental resources.

Institutional economics 882 (LEK 882)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MAgric Rural Development MSc Environmental Economics (Coursework) MSc Environmental Management (Coursework) MScAgric Agricultural Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Institutional and behavioural economics. This module will expose students to the principles of the New Institutional Economics paradigm and how it can be utilized to improve the analysis of agricultural economic and agricultural development problems and issues. Major themes covered are: The agricultural development challenge: stylised features; new institutional economics: distinctive features and concepts; institutions and development: A historical and macro-perspective techno-economic characteristics and agricultural systems and products in poor countries; NIE analysis of markets and markets structures; the State: Political and institutional determinants of agricultural policy; collective action; transactions costs in smallholder agriculture; case studies.

Agricultural supply chain management 883 (LEK 883)

Qualification	Postgraduate
Module credits	15.00
Programmes	MPhil Agricultural Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	1 lecture per week

Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1 or Semester 2

Module content

Agricultural supply chain analysis. Explore the evolution of supply chain management in the global food industry. Establish the different ways in which supply chain management can provide a source of competitive advantage at industry level and for individual firms. Examine the crossfunctional and multidisciplinary nature of supply chain management as it applies in the global food industry. Introduce the core elements of the theoretical literature on supply chain management and consider applications in different sectors. Provide students with practical experience in applying the principles of supply chain management to the exploitation of a marketing opportunity, using case examples from the fresh produce and meat sectors. Provide students with practical experience of undertaking a supply chain audit, with a view to establishing an appropriate business strategy for a food manufacturing company.

Advanced rural finance 884 (LEK 884)

Qualification	Postgraduate
Module credits	15.00
Programmes	MAgric Rural Development MAgric Rural Development
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 1

Module content

Overview of rural finance: conceptual issues. Role of financial services in economic development. Relationship between financial development and economic growth. Economic theory underlying rural financial markets: market and government failure, imperfect information, transaction costs, agency theory, and pecking order theory. Supply of and demand for financial services in rural areas: theory and measurement issues. Estimating credit demand, supply and constraints. Institutions involved in the provision of rural financial services and innovations in rural finance. Assessing performance of institutions providing rural financial services.

The economics of natural resources 886 (LEK 886)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	LEK 810 or equivalent
Contact time	1 lecture per week

Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

The economics of natural resources. This course will introduce students to the techniques of optimisation overtime, optimal allocation and management of non-renewable and renewable resources, with case studies from Africa. The influence of property rights regimes on optimal natural resource use will also be stressed. The course consists of three main sections: Methods of dynamic optimisation; Theory of exhaustible and renewable resources and growth models; and Property rights and natural resource use with case studies from Africa.

Selected topics in environmental economics 887 (LEK 887)

Qualification	Postgraduate
Module credits	15.00
Programmes	MPhil Agricultural Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	MIE 780 and EKT 713 or equivalents
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Semester 2

Module content

Selected topics in environmental economics. This module will introduce students to various issues of special importance in environmental economics and policy with special emphasis on international dimensions. Examples of key themes to be covered include trade and the environment, trans-boundary externalities, global public goods, multi-lateral environmental agreements, international aid, economic growth and environmental change, poverty and the environment, etc. The main objective of the module is to equip students with the appropriate tools for analysing the linkages between economic development, trade and globalization, poverty, economic and environmental policy and environmental change.

Dissertation: Agricultural economics 890 (LEK 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MCom Agricultural Economics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo

Period of presentation	Year

Mini-dissertation 891 (LEK 891)

Qualification	Postgraduate
Module credits	100.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Mini-dissertation: Agricultural economics 892 (LEK 892)

Qualification	Postgraduate
Module credits	90.00
Programmes	MSc Environmental Economics (Coursework) MSc Environmental Economics (Coursework) MScAgric Agricultural Economics (Coursework)
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Mini-dissertation: Environmental economics 893 (LEK 893)

Qualification	Postgraduate
Module credits	90.00
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Dissertation: Agricultural economics 898 (LEK 898)

Qualification	Postgraduate
Module credits	120.00
Programmes	MPhil Agricultural Economics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Thesis: Agricultural economics 990 (LEK 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Agricultural Economics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Thesis: Agricultural economics 991 (LEK 991)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Agricultural Economics PhD Agricultural Economics
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Agricultural Economics Extension and Rural Develo
Period of presentation	Year

Life assurance 700 (LEW 700)

Qualification	Postgraduate
Module credits	40.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Semester 2

Module content

The following aspects of the operation of a life insurance company are covered: General business environment; products offered; asset shares for life insurance contracts; with-profits surplus distribution; actuarial funding; models; setting of assumptions; aspects of products design; alterations to contracts; development and maintenance; investment; risk management procedures including reinsurance and underwriting; cost of guarantees; policy data checks; capital management and the actuarial control cycle. Modelling and monitoring policy cashflows for purposes of pricing, profit analysis, statutory valuation reserves and ongoing solvency.

Environmental biophysics 450 (LKM 450)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Applied Plant and Soil Sciences
Prerequisites	WTW 134
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Environmental variables. Quantitative description and measurement of atmospheric environmental variables and water in organisms. Mass and energy fluxes. Quantitative description of energy fluxes in organisms' environments. Energy balances of animals and plant communities will be derived.

Environmental biophysics 750 (LKM 750)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Environmental variables. Quantitative description and measurements of atmospheric environmental variables and water in organisms. Mass and energy fluxes. Quantitative description of energy fluxes in organisms' environments. Energy balances of animals and plant communities will be derived.

Linear models 710 (LMO 710)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematical Statistics BScHons Mathematics of Finance

Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WST 311, WST 312, WST 321
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Projection matrices and sums of squares of linear sets. Estimation and the Gauss-Markov theorem. Generalised t- and F- tests.

Linear models 720 (LMO 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematical Statistics BScHons Mathematics of Finance
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	LMO 710
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

The singular normal distribution. Distributions of quadratic forms. The general linear model. Multiple comparisons. Analysis of covariance. Generalised linear models. Analysis of categorical data.

Language and study skills 110 (LST 110)

Qualification	Undergraduate
Module credits	6.00

Programmes	Bachelor of Veterinary Nursing BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematical Statistics BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Unit for Academic Literacy
Period of presentation	Semester 1

Module content

The module aims to equip students with the ability to cope with the reading and writing demands of scientific disciplines.

Language, life and study skills 133 (LST 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	As for BSc Four-year programme and BCom Four-year programme
Contact time	4 discussion classes per week, Foundation Course
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences Deans Office
Period of presentation	Semester 1

Module content

In this module students use different information and time management strategies, build academic vocabulary, revise basic grammar concepts and dictionary skills, examine learning styles, memory and note-taking techniques, practise academic reading skills and explore basic research and referencing techniques, learn how to use discourse markers and construct definitions, and are introduced to paragraph writing. The work is set in the context of the students' field of study.

Language, life and study skills 143 (LST 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	LST 133
Contact time	4 discussion classes per week, Foundation Course
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences Deans Office
Period of presentation	Semester 2

Module content

In this module students learn how to interpret and use visual literacy conventions. Students write more advance paragraphs, and also learn how to structure academic writing, how to refine their use of discourse markers and referencing techniques and how to structure their own academic arguments. Students' writing is expected to be rational, clear and concise. As a final assignment all aspects of the LST 133 and LST 143 modules are combined in a research assignment. In this project, students work in writing teams to produce a chapter on a career and to present an oral presentation of aspects of the chapter. The work is set in the context of the students' field of study.

Introduction to microbiology 161 (MBY 161)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Chemistry BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Extended programme - Biological and Agricultural Sciences BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MLB 111 GS
Contact time	2 lectures per week, fortnightly tutorials
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

The module will introduce the student to the field of Microbiology. Basic Microbiological aspects that will be covered include introduction into the diversity of the microbial world (bacteria, archaea, eukaryotic microorganisms and viruses), basic principles of cell structure and function, microbial nutrition and microbial growth and growth control. Applications in Microbiology will be illustrated by specific examples i.e. bioremediation, animal-microbial symbiosis, plant-microbial symbiosis and the use of microorganisms in industrial microbiology. Wastewater treatment, microbial diseases and food will be introduced using specific examples.

Bacteriology 251 (MBY 251)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MBY 161 GS
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Growth, replication and survival of bacteria, Energy sources, harvesting from light versus oxidation, regulation of catabolic pathways, chemotaxis. Nitrogen metabolism, iron-scavenging. Alternative electron acceptors: denitrification, sulphate reduction, methanogenesis. Bacterial evolution, systematic and genomics. Biodiversity; bacteria occurring in the natural environment (soil, water and air), associated with humans, animals, plants, and those of importance in foods and in the water industry.

Mycology 261 (MBY 261)

Qualification	Undergraduate

Module credits	12.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Microbiology BSc Plant Science BSc Zoology BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MBY 161 GS
Contact time	Fortnightly practicals/tutorials, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Organisation and molecular architecture of fungal thalli, chemistry of the fungal cell. Chemical and physiological requirements for growth and nutrient acquisition. Mating and meiosis; spore development; spore dormancy, dispersal and germination. Fungi as saprobes in soil, air, plant, aquatic and marine ecosystems; role of fungi as decomposers and in the deterioration of materials; fungi as predators and parasites; mycoses, mycetisms and mycotoxicoses; fungi as symbionts of plants, insects and animals. Applications of fungi in biotechnology.

Food microbiology 262 (MBY 262)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Culinary Science BSc Food Science BSc Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology
Prerequisites	MBY 251 or permission from HOD.

Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Primary sources of migroorganisims in food. Factors affecting the growth and survival of microorganisms in food. Microbial quality, spoilage and safety of food. Different organisms involved, their isolation, screening and detection. Conventional approaches, alternative methods rapid methods. Food fermentations: fermentation types, principles and organisms involved.

Virology 351 (MBY 351)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BScAgric Plant Pathology
Prerequisites	GTS 251 GS and MBY 161 or permission from the HOD.
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Introduction to the viruses as a unique kingdom inclusive of their different hosts, especially bacteria, animals and plants; RNA and DNA viruses; viroids, tumour viruses and oncogenes, mechanisms of replication, transcription and protein synthesis; effect on hosts; viral immunology; evolution of viruses.

Bacterial genetics 355 (MBY 355)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science
Prerequisites	GTS 251 GS, GTS 261 GS, MBY 161, MBY 251 GS and MBY 262 GS or permission from the HOD.
Contact time	2 lectures per week, 1 practical/tutorial per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

DNA replication and replication control. DNA recombination. DNA damage and repair. Genetics of bacteriophages, plasmids and transposons. Bacterial gene expression control at the transcriptional, translational and post-translational levels. Global regulation and compartmentalisation.

Genetic manipulation of microbes 364 (MBY 364)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BScAgric Plant Pathology
Prerequisites	BCM 251, GTS 251 and MBY 251 or permission from the HOD.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Isolation of clonable DNA (genomic libraries, cDNA synthesis) cloning vectors (plasmids, bacteriophages, cosmids) plasmid incompatibility and control of copy number. Ligation of DNA fragments, modification of DNA end and different ligation strategies. Direct and indirect methods for the identification of recombinant organisms. Characterization (polymerase chain reaction, nucleic acid sequencing) and mutagenisis of cloned DNA fragments. Gene expression in Gram negative (E.coli) Gram positive (B.subtilis) and yeast cells (S.cerevisea). Use of Agrobacterium and baculoviruses for gene expression in plant and insect cells respectively. Applications in protein engineering, diagnostics and synthesis of useful products.

Microbe interactions 365 (MBY 365)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Human Genetics BSc Biochemistry BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BScAgric Plant Pathology
Prerequisites	GTS 251, MBY 251, MBY 261 GS, MBY 262 GS, and MBY 355 GS or permission from the HOD.
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Interactions between microbes and their abiotic environment; microbial interaction with other strains of the same and other species; microbial interactions across kingdoms; pathogenic interactions between microbes and plant or animal hosts; mutualistic interactions between microbes and their hosts; introduction to systems biology.

Research project 756 (MBY 756)

Qualification	Postgraduate
Module credits	50.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Microbiology and Plant Pathology
Period of presentation	Year

Module content

Research undertaken in a specific topical area in microbiology.

Dissertation: Microbiology 890 (MBY 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Microbiology MSc Microbiology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Thesis: Microbiology 990 (MBY 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Microbiology PhD Microbiology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Mathematics and mathematical literacy education 730 (MCE 730)

Qualification	Postgraduate
Module credits	16.00
Programmes	BEdHons Teacher Education and Professional Development BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Science Mathematics and Technology Education
Period of presentation	Semester 1 or Semester 2

Module content

Perspectives in the teaching and learning of mathematics. This module will focus on contemporary issues in mathematics education such as: Types of mathematical knowledge in teacher education; learning theories in mathematics education; use of technology in the teaching of mathematics; classroom research; gender; language; culture (Ethno mathematics). Mathematics in context: prospects and challenges. This module also focuses on the role of mathematics in different contexts (including vocational and real life contexts): Nature of mathematics – mathematics as a human activity; rationale for learning mathematics; the theory of realistic mathematics education; content-driven and context-driven approach in mathematics; mathematical literacy; knowledge 'transfer': some challenges – school mathematics vs real world.

Research methods 751 (MCP 751)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Biotechnology BScHons Biotechnology BScHons Microbiology
Prerequisites	No prerequisites.
Contact time	7 lectures per week, 5 practicals per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

The module provides students with planning, data handling, writing, and presentation skills required for microbiological research. In addition, students are provided with hands-on experience in the advanced techniques utilised in research and analysis. Ethnical and philosophical issues in the broader field of Microbiology and Plant Pathology are also addressed.

Seminar course 752 (MCP 752)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Microbiology BScHons Microbiology
Prerequisites	No prerequisites.
Contact time	3 discussion classes per week, 2 seminars per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Students are guided to collect relevant literature from disparate papers in the broader field of Microbiology and Plant Pathology and to condense and collate this into a written seminar, which is also presented verbally.

Trends in microbiology 753 (MCP 753)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Microbiology BScHons Microbiology
Prerequisites	No prerequisites.
Contact time	3 discussion classes per week, 2 seminars per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

Discussions and essays focusing on recent advances in the broader field of Microbiology and Plant Pathology, as well as contextualising these developments within the broader framework of the Biosciences and its role in modern society.

Research project and literature study 754 (MCP 754)

Qualification	Postgraduate
Module credits	60.00
Programmes	BScHons Biotechnology BScHons Biotechnology BScHons Microbiology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Year

Module content

The module includes both practical and theoretical components. In addition to an individual research project with well-defined limits that is undertaken under the guidance of a lecturer, the module also acquaint the student with the theoretical aspects relevant to a specific research topic. The research project is thus preceded by the presentation of an in-depth review of the relevant literature, and the project is concluded with a progress report, presented in the format of a short publication and an oral presentation.

Macroeconomics 780 (MEK 780)

Qualification	Postgraduate

Module credits	15.00
Programmes	BSocSciHons Philosophy, Politics and Economics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission into relevant programme
Contact time	2 lectures per week, 1 seminar per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

This module will cover the core theoretical concepts of macroeconomics focussing specifically on labour and goods markets as well as intertemporal issues, such as capital markets. Topics will include economic growth, exogenous and endogenous, business cycles, monetary economics, stabilization policies and structural policies.

Medical physics 700 (MFK 700)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Medical physics 800 (MFK 800)

Qualification	Postgraduate
Module credits	36.00
Programmes	MMed Radiological Diagnostics
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Medical physics 801 (MFK 801)

Qualification	Postgraduate
Module credits	36.00
Programmes	MMed Radiation Oncology
Prerequisites	No prerequisites.

Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

People and their environment 112 (MGW 112)

Qualification	Undergraduate
Module credits	6.00
Programmes	BDietetics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Sociology
Period of presentation	Semester 1

Module content

This module comprises basic psychology and sociology concepts relevant to Medicine, and to Dentistry, in the case of BChD students.
Basic psychiatric concepts are also taught.

Microeconomics 780 (MIE 780)

Qualification	Postgraduate
Module credits	15.00
Programmes	BSocSciHons Philosophy, Politics and Economics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission into relevant programme
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Economics
Period of presentation	Semester 1

Module content

The core concepts of microeconomic theory will be the focus of the module, including: demand and supply, consumer theory, firm theory, markets and market structure, general equilibrium, information economics and behavioural economics. Applications of this theory will feature prominently.

Molecular and cell biology 111 (MLB 111)

Qualification	Undergraduate
Module credits	16.00
Programmes	BDietetics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science
Prerequisites	A candidate who has passed Mathematics with at least 60% in the Grade 12 examination
Contact time	1 practical/tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Introduction to the molecular structure and function of the cell. Basic chemistry of the cell. Structure and composition of prokaryotic and eukaryotic cells. Ultrastructure and function of cellular organelles, membranes and the cytoskeleton. General principles of energy, enzymes and cell metabolism. Selected processes, e.g. glycolysis, respiration and/or photosynthesis. Introduction to molecular genetics: DNA structure and replication, transcription, translation. Cell growth and cell division.

Molecular and cell biology 133 (MLB 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	Admission to the relevant programme.
Contact time	2 practicals per week, 2 lectures per week, Foundation Course, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The scientific method, the meaning of life, principles of microscopy, introduction to taxonomy and systematics, introductory study of the structure, function and composition of akaryotes, HIV/ Aids, the immune system and other health issues, ecosystems and human interference.

Molecular and cell biology 143 (MLB 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MLB 133
Contact time	2 practicals per week, 2 discussion classes per week, Foundation Course, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Chemistry of the cell, introduction to the structure, function and composition of prokaryotic and eukaryotic cells, energy and cellular metabolism, photosynthesis.

Molecular and cell biology 153 (MLB 153)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MLB 143
Contact time	2 practicals/tutorials per week, 2 lectures per week, Foundation Course
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

Cell growth and cell division, Mendelian and human genetics, principles of molecular genetics, principles of recombinant DNA technology and its application.

Molecular and cellular biology 721 (MLB 721)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Genetics BScHons Biochemistry BScHons Bioinformatics BScHons Biotechnology BScHons Genetics BScHons Microbiology
Prerequisites	No prerequisites.
Contact time	2 discussion classes per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

Principles and applications of recombinant DNA, and other novel molecular and genomics technologies, to address questions in the biological sciences and/or biotechnology. Strong emphasis is placed on the principles of research planning, including identifying suitable research objectives, formulating a research strategy and understanding the relevance and feasibility of research. The module is assessed by means of a research project proposal, conceived and formulated by each student. The proposal must focus on the use of molecular technologies in addressing realistic questions in biology and/or biotechnology. There is also an oral defense of the project proposal.
This module is jointly presented in the Departments of Biochemistry, Genetics and Microbiology.

Dissertation: Medical plant science 890 (MPS 890)

Qualification	Postgraduate

Module credits	180.00
Programmes	MSc Medicinal Plant Science MSc Medicinal Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Thesis: Medicinal plant science 990 (MPS 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Medicinal Plant Science PhD Medicinal Plant Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Medical terminology 180 (MTL 180)

Qualification	Undergraduate
Module credits	12.00
Programmes	BRad Diagnostics
Service modules	Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Ancient and Modern Languages and Cultures
Period of presentation	Semester 1 and Semester 2

Module content

The acquisition of a basic medical orientated vocabulary compiled from Latin and Greek stem forms combined with prefixes and suffixes derived from those languages. The manner in which the meanings of medical terms can be determined by analysing the terms into their recognisable meaningful constituent parts, is taught and exercised. The functional use of medical terms in context as practical outcome of terminological application is continually attended to.

Multivariate analysis 710 (MVA 710)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematical Statistics BScHons Mathematics of Finance
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WST 311, WST 312, WST 321
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Matrix algebra. Some multivariate measures. Visualising multivariate data. Multivariate distributions. Samples from multivariate normal populations. The Wishart distribution. Hotelling's T^2 statistic. Inferences about mean vectors.

Multivariate analysis 720 (MVA 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematical Statistics BScHons Mathematics of Finance
Service modules	Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	MVA 710
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Discriminant analysis and classification. Principal component analysis. The biplot. Multidimensional scaling. Factor analysis. Probabilistic clustering.

Statistical and machine learning 880 (MVA 880)

Qualification	Postgraduate

Module credits	20.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Admission to the relevant programme.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Unsupervised learning: deterministic clustering, model-based clustering, latent class and behavioural analytics, dimension reduction. Natural language processing and topic modelling; recommender systems. Organisation of data, data wrangling and data structure exploration.

Mini-dissertation: eScience 800 (NEP 800)

Qualification	Postgraduate
Module credits	90.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	Completion of the coursework programme.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Module content

This is the research component of the MSc (eScience) degree and comprises a mini-dissertation which develops the research skills and bridges the gap between theory and practice.

Research methods and capstone project in data science 801 (NEP 801)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Scientific writing styles; layouts for assignments, projects, theses or publications; research methodologies; scientific assignments; integration of all the aforementioned content items for a capstone project in data science.

Data privacy and ethics 802 (NEP 802)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Technical processes of data collection, storage, exchange and access; Ethical aspects of data management; Legal and regulatory frameworks in South Africa and in relevant jurisdictions; Data policies; Data privacy; Data ownership; Legal liabilities of analytical decisions and discrimination; and the Technical and algorithmic approaches to enhance data privacy, and relevant case studies.

Adaptive computation and machine learning 803 (NEP 803)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Introduction: Basic concepts. Supervised learning setup: Least means squares, logistic regression, perceptron, exponential family, generative learning algorithms, Gaussian discriminant analysis, naïve Bayes, support vector machines, model selection and feature selection. Learning theory: bias/variance tradeoff, union and Chernoff/Hoeffding bounds, VC dimension, worst case (online) learning. Unsupervised learning: clustering, k-means, expectation maximisation, mixture of Gaussians, factor analysis, principal components analysis, independent components analysis. Reinforcement learning and control: Markov decision processes, Bellman equations, value iteration and policy iteration, Q-learning, value function approximation, policy search, reinforce, partially observable Markov decision problems.

Data visualisation and exploration 804 (NEP 804)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Data and image models; visualisation attributes (colour) and design (layout); exploratory data analysis; interactive data visualisation; multidimensional data; graphical perception; visualisation software (Python & R); and types of visualisation (animation, networks and text).

Large-scale computing systems and scientific computing 805 (NEP 805)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to scientific computing architectures in Python, introduction to distributed systems, introduction to distributed databases, introduction to parallelism, large-data computation and storage models, introduction to well-known distributed systems architectures, and programming large-data applications on open-source infrastructures for data processing and storage systems.

Mathematical foundations of data science 806 (NEP 806)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics

Period of presentation	Semester 1 or Semester 2

Module content

High-dimensional space, best-fit subspaces and singular value decomposition, random walks and Markov chains, statistical machine learning, clustering, random graphs, topic models, matrix factorisation, hidden Markov models, graphical models, wavelets, and sparse representations.

Special topics in data science 807 (NEP 807)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Specialised and applied concepts and trends in data science.

Statistical foundations of data science 808 (NEP 808)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

An understanding of multivariate statistics, hypothesis testing and confidence intervals. The ability to model data using well-known statistical distributions as well as the ability to handle data that is both continuous and categorical. The ability to perform statistical modelling including multivariate linear regression and adjust for multiple hypotheses. Forecasting, extrapolation, prediction and modelling using statistical methods. Bayesian statistics, an understanding of bootstrapping and Monte Carlo simulation.

Large-scale optimisation for data science 809 (NEP 809)

Qualification	Postgraduate
Module credits	15.00

Programmes	MSc eScience (Coursework) MSc eScience (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to convex optimisation, subgradient methods, decomposition and distributed optimisation, proximal and operator splitting methods, conjugate gradients, and nonconvex problems.

Ecosystems and wildlife management 311 (NLB 311)

Qualification	Undergraduate
Module credits	4.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

NLB 311 and NLB 312 are presented over a period of 21 days as one integrated module. Both modules are aimed at students of wildlife management and veterinary sciences. These study programmes offer an exciting, hands-on, in-depth educational experience, taking students behind the scenes in the wildlife field in Southern Africa.
The training takes part during a camping and lodging expedition. Students interact with wildlife biologists, rangers, veterinarians and researchers working in the field, giving them an insight into the successes and problems associated with conservation from both an ecological and veterinary perspective. Participants also meet and learn from pioneers in game capture and those actively involved in the field of wildlife veterinary science on a day-to-day basis. The students also participate in actual game capture operations. Students also study and observe the role that veterinarians play at a wildlife rehabilitation centre, a reptile park and a rare-species breeding ranch.
Module content
• Wildlife management techniques
• Sustainable resource utilization
• Ecosystem and biodiversity conservation
• Reserve and resort management
• African local community cultures and conservation perspectives
• Capture and care of wild animals
• Wildlife disease management
• Population dynamics

Participatory nature conservation 312 (NLB 312)

Qualification	Undergraduate
Module credits	4.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

NLB 311 and NLB 312 are presented over a period of 21 days as one integrated module. Both modules are aimed at students of wildlife management and veterinary sciences. These study programs offer an exciting, hands-on, in-depth educational experience, taking students behind the scenes in the wildlife field in Southern Africa.
The training takes part during a camping and lodging expedition. Students interact with wildlife biologists, rangers, veterinarians and researchers working in the field, giving them an insight into the successes and problems associated with conservation from both an ecological and veterinary perspective. Participants also meet and learn from pioneers in game capture and those actively involved in the field of wildlife veterinary science on a day-to-day basis. The students also participate in actual game capture operations. Students also study and observe the role that veterinarians play at a wildlife rehabilitation centre, a reptile park and a rare-species breeding ranch.
Module content
• Wildlife management techniques
• Sustainable resource utilization
• Ecosystem and biodiversity conservation
• Reserve and resort management
• African local community cultures and conservation perspectives
• Capture and care of wild animals
• Wildlife disease management
• Population dynamics

Wildlife ecology 780 (NLB 780)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

Research in wildlife management focuses on gaining a better understanding of patterns of animal distribution, abundance, and diversity, and implementation of scientifically sound strategies for sustainable management and conservation of wildlife populations. This module will develop an in-depth understanding of core wildlife management concepts with a focus on population characteristics, the density concept, mortality, natality, life tables, population growth, harvesting quotas, population regulation, population structure, dispersal, dispersion, aggregation, isolation and territoriality, competition and predator-prey relationships. This module will also explore new ideas, and advanced research methods to evaluate ecological data in the context of wildlife ecology.

Wildlife management principles and techniques 781 (NLB 781)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per month
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

The most important techniques applicable to wildlife management and wildlife research are discussed. The principles, applications and restrictions of the following are discussed amongst others: wildlife counts, age determination, age and sex ratios, translocation of animals, chemical immobilisation, mechanical capture techniques, transport of wildlife, land-use, predator control and predator-prey studies.

Wildlife nutrition 782 (NLB 782)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	2 practicals, 3 Block weeks
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

Ensuring essential prior knowledge of the fundamentals of nutrition through peer-assisted learning strategies. The digestive functioning of selected wild ruminant and non-ruminant herbivores is discussed as well as their nutrient requirements and deficiencies that commonly occur. The spatial scaling of nutrients in vegetation is explained, followed by which foraging strategies large African herbivores of varying body sizes use to adapt to spatial and temporal nutrient heterogeneity, including optimal foraging theory.

Parasites, diseases and the capture of wildlife animals 783 (NLB 783)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

Parasites, diseases and capture of wild animals. An overview of veterinary aspects with reference to important parasites and diseases of wild animals. The capture of wildlife and the stress-related consequences of the capture of wild animals. The module content includes a discussion of all the different chemicals used to immobilise wild animals, darting, and handling of wild animals under sedation. The internal and external parasites, most important contagious wildlife diseases and the prevention of capture related diseases are discussed.

Scientific communication 785 (NLB 785)

Qualification	Postgraduate
Module credits	5.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

This module focuses on elements of science communication, developing practical elements of scientific communication, writing and public presentations.

Research project 795 (NLB 795)

Qualification	Postgraduate
Module credits	50.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

A research protocol, field work and project report based on an ecological or wildlife management topic.

Wildlife management (Exam) 801 (NLB 801)

Qualification	Postgraduate
Module credits	1.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Wildlife ecology 810 (NLB 810)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Wildlife Health, Ecology and Management (Coursework)
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

A module on plant ecology, veld management, animal ecology and plant and animal interactions. The students will gain a solid grounding and in-depth understanding of ecological theory and ecological management to maintain and improve ecosystem health. This module will provide a broad view, illustrating a wide variety of different ecosystem examples and will include in-field training in areas around HHWRS.

Dissertation: Wildlife management 890 (NLB 890)

Qualification	Postgraduate
Module credits	180.00

Programmes	MSc Wildlife Management MSc Wildlife Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Wildlife management 990 (NLB 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Wildlife Management PhD Wildlife Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Research methodology 814 (NMN 814)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

The aim of this module is to analyse the core concepts in social research and to provide a conceptual framework of the research process. It includes the following topics: a conceptual model of social science research, the logic of the research process, the different forms of scientific reasoning, and the stages in the research process being the formulation of the research problem, research design, conceptualisation, operationalisation, sampling, data-collection and data-analysis.

Educational research methodology 745 (NMQ 745)

Qualification	Postgraduate
Module credits	16.00

Programmes	BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling
Language of tuition	Module is presented in English
Department	Science Mathematics and Technology Education
Period of presentation	Semester 1

Module content

The nature of educational enquiry: contexts of research, research ethics, truth, rationality, subjectivity and objectivity; Quantitative and qualitative modes of enquiry, research designs and data collection techniques. Various approaches to qualitative research including case study research, historical research, ethnographic research, and action research. Basic concepts and principles of quantitative research. Statistical techniques in the educational research process. Survey methodology and questionnaire design. Classification and graphical representation of data. Descriptive measures. Statistical inference. Data-processing procedures. Parametric versus non-parametric tests. Some test statistics (e.g. F-Test and T-test). Formulating a research methodology for a limited project.

Research project 780 (NPN 780)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Actuarial Science BScHons Actuarial Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Actuarial Science
Period of presentation	Year

Module content

The research project is compulsory. A detailed project proposal should be submitted to the head of department by a prescribed date for approval, as described in the departmental document in this regard.

Nutritional assessment 313 (NTA 313)

Qualification	Undergraduate
Module credits	40.00
Programmes	BDietetics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	3rd-year status
Contact time	1 practical per week, 4 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English

Department	Human Nutrition
Period of presentation	Semester 1

Module content

Evaluation of nutritional assessment.
Nutrition care process, overview of evaluation of nutritional status. Scientific principles of evaluation of nutritional status; nutritional screening; clinical, biochemical and dietary evaluation of nutritional status. Practice training: practising of theoretical principles of nutrition status evaluation in hospital/clinic and/or skills laboratory.

Nutritional assessment 314 (NTA 314)

Qualification	Undergraduate
Module credits	22.00
Programmes	BSc Nutrition BSc Nutrition
Prerequisites	Third-year status
Contact time	4 lectures per week, 1 discussion class per week
Language of tuition	Afrikaans and English are used in one class
Department	Human Nutrition
Period of presentation	Semester 1

Module content

Evaluation of nutritional assessment.
Nutrition care process; overview of evaluation of nutritional status. Scientific principles of evaluation of nutritional status; nutritional screening; clinical, biochemical and dietary evaluation of nutritional status.

Design principles 111 (OBG 111)

Qualification	Undergraduate
Module credits	7.00
Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

An introduction to the elements and principles of design as is applicable to interior and clothing design and food preparation. Colour theory.

Business management 114 (OBS 114)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSc Mathematics BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Applied Mathematics BSc Geoinformatics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	May not be included in the same curriculum as OBS 155
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 1

Module content

The entrepreneurial mind-set; managers and managing; values, attitudes, emotions, and culture: the manager as a person; ethics and social responsibility; decision making; leadership and responsible leadership; effective groups and teams; managing organizational structure and culture inclusive of the different functions of a generic organisation and how they interact (marketing; finance; operations; human resources and general management); contextualising Sustainable Development Goals (SDG) in each of the topics.

Business management 124 (OBS 124)

Qualification	Undergraduate
Module credits	10.00
Programmes	BSocSci Industrial Sociology and Labour Studies BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences

Prerequisites	Admission to the examination in OBS 114
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 2

Module content

Value chain management: functional strategies for competitive advantage; human resource management; managing diverse employees in a multicultural environment; motivation and performance; using advanced information technology to increase performance; production and operations management; financial management; corporate entrepreneurship.

Business management 133 (OBS 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences
Prerequisites	Only available to BCom (Four-year programme) students
Contact time	1 discussion class per week, Foundation Course, 3 lectures per week
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 1

Module content

Introduction to Business Management as a science, the environment in which the enterprise operates, the field of business, the mission and goals of an enterprise, management and entrepreneurship. The choice of a form of enterprise, the choice of products and/or services, profit and cost planning for different sizes of operating units, the choice of location, the nature of production processes and the layout of the plant or operating unit.

Business management 143 (OBS 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences
Prerequisites	OBS 133; Only available to BCom (Four-year programme) students
Contact time	3 lectures per week, Foundation Course, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 2

Module content

Introduction to and overview of general management, especially regarding the five management tasks, strategic management, contemporary developments and management issues, financial management, marketing, public relations. (Note: For marketing students, marketing is replaced by financial management, and public relations by small business management.)
Introduction to and overview of the value chain model, management of the input,
management of the purchasing function, management of the transformation process with specific reference to production and operations management, human resources management, and information management; corporate governance and black economic empowerment (BEE).

Business management 210 (OBS 210)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom Informatics Information Systems BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences
Prerequisites	OBS 114 or 124 with admission to the examination in the other
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 1

Module content

Logistics management
The role of logistics in an enterprise; definition and scope of customer service; electronic and other logistics information systems; inventory management; materials management with special reference to Japanese systems; management of the supply chain. Methods of transport and transport costs; types and costs of warehousing; electronic aids in materials handling; cost and price determination of purchases; organising for logistics management; methods for improving logistics performance.

Business management 220 (OBS 220)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom Informatics Information Systems BConSci Clothing Retail Management BConSci Hospitality Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Natural and Agricultural Sciences

Prerequisites	OBS 114 or 124 with admission to the examination in the other. Students from other Faculties are required to have 50% for Mathematics in Grade 12.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Business Management
Period of presentation	Semester 2

Module content

Project management and negotiations:
Introduction Project management concepts; needs identification; the project, the project manager and the project team; types of project organisations; project communication and documentation. Planning and control: planning, scheduling and schedule control of projects; resource considerations and allocations; cost planning and performance evaluation.
Negotiation and collective bargaining: The nature of negotiation; preparation for negotiation; negotiating for purposes of climate creation; persuasive communication; handling conflict and aggression; specialised negotiation and collective bargaining in the South African context.

Weed science 413 (OKW 413)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Plant Pathology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	PLG 251
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Identification of important weeds of crops, gardens and recreational areas.
Identification of alien invasive and indigenous encroaching species. Impacts of weeds on desirable vegetation. Interference between crop and weed species through allelopathy and competition phenomena. Role of weeds in plant-biodiversity and crop production potential. Weeds in annual and perennial crop situations. Weed biology and ecology. Mechanical, cultural, biological and chemical weed management practices. Integrated weed management. Herbicide formulations and application techniques. Modes of action of herbicides, and their behaviour and fate in the environment.

Environmental change 881 (OMS 881)

Qualification	Postgraduate
Module credits	15.00

Programmes	MSc Forest Management and the Environment (Coursework) MSc Environment and Society (Coursework) MSc Environmental Management (Coursework) MSc Forest Management and the Environment (Coursework)
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

This module involves the study of the causes and consequences of environmental change from multidisciplinary perspectives. A focus of this course is human environmental interactions. Past processes leading to environmental change will also be discussed. In a given period, the following will be investigated: principles of environmental change, causes and consequences of environmental change, Global warming and climate change: causes and impacts of climate change on natural resources; water, forests, biodiversity, land use and land cover change, environmental/Climate change and infectious disease, human dimensions of global change and Climate change political responses including the Kyoto protocol. Mitigation and adaptation strategies to climate change and effects of Climate change on sustainable development.

Research report: Environment and society 895 (OMS 895)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Experiential training in industry 400 (OPI 400)

Qualification	Undergraduate
Module credits	5.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	Documentation of work experience as required for years 1-3
Contact time	1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

During the first to fourth years of study students must complete a total of 600 hours experiential training in the industry to develop practical and occupational skills, participate in community engagement and provide service learning. This is equal to 3 weeks x40 hours (120 hours) per year for the first to third year and 6 weeks x 40 hours in the fourth year, including the following:

- event management for Hospitality Management students, according to requirements as determined by the head of department;

or

- a culinary science project application for Culinary Science students, according to requirements as determined by the head of department. These 'credits' comprise 50 learning hours and the balance of the hours include work-related experience evidence of experiential training, service learning and community engagement during the four years of the degree programme and must be successfully completed together with a complete portfolio before the degree will be conferred.

Please note: Various practical and industry-interaction activities support the theoretical component of VDS 322, 413, 414, 417, 424, 427, FST 412 and TBE 311 (as applicable to the respective Consumer Science programmes) and take place after hours to develop practical and industry skills.

Experiential training in industry 480 (OPI 480)

Qualification	Undergraduate
Module credits	6.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Experiential training in the industry: During the 4 years of study, during holidays, weekends and after hours, students must complete a total of 480 hours experiential training in the industry to develop practical and occupational skills. This is equal to 3 weeks x 40 hours (120 hours) per year, according to requirements as determine by the head of department. This training must be successfully completed together with a complete portfolio before the degree will be conferred.

Production physiology 700 (PFS 700)

Qualification	Postgraduate
Module credits	22.00
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences

Period of presentation	Year

Module content

Specialised study of physiological and anatomical factors that influence growth, development, production and product quality. Stress and intensification effects on product quality. Animal science pharmacology. (Theoretical components include VKF 411 and VSX 420.)

Production physiology 801 (PFS 801)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Specialised study of physiological and anatomical factors that influence growth, development, reproduction and production. Stress and intensification effects on the metabolism of animals. The mechanisms of disease and erosion losses and the modification of reproduction and growth. Specific topics are studied by way of literature, seminars, discussions and research assignments.

Soil-water relationship and irrigation 350 (PGW 350)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geology BSc Geology BScAgric Applied Plant and Soil Sciences
Prerequisites	GKD 250
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Quantitative description and measurement of soil water content and potential as well as saturated and unsaturated hydraulic conductivity. Modelling water flow in soil (Darcy’s law, Richards's equation). Infiltration, redistribution, evaporation, runoff and percolation. Irrigation in South Africa. Modelling and managing the soil water balance. Plant water consumption and the soil-plant-atmosphere continuum. Irrigation scheduling (soil, plant and atmosphere approaches). Managing poor quality water. Irrigation systems. The module includes a field trip to an irrigation scheme.

Seminar 400 (PGW 400)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Plant Pathology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 3 seminars per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Basic principles of the scientific process. Literature accessing and article assessment. Manuscript preparation and presentation of seminars. Basic instruction on the use of visual aids, etc. for effective oral presentations.

Experimental design and analysis 421 (PGW 421)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Plant Pathology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	BME 120
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Basic experimental designs. Measurement and control over experimental error. Factorial experiments and interactions. Analysis of variance (ANOVA) and data interpretation.

Research project in crop science 701 (PGW 701)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	1 discussion class per week

Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Students will design, execute and write up a research project in any one of the subdisciplines of Crop science, eg Agronomy, Horticultural science or Pasture science.

Scientific communication 702 (PGW 702)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	2 seminars, 1 lecture per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Principles of the scientific process. Literature accessing and article assessment. Manuscript preparation and presentation of seminars. Use of visual aids.

Research methodology 704 (PGW 704)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science BScHons Soil Science Environmental Soil Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Basic experimental designs. Measurements and control over experimental error. Factorial experiments and interactions. Analysis of variance (ANOVA) and data interpretation.

First course in physics 114 (PHY 114)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geography BSc Geology BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	A candidate must have passed Mathematics and Physical Science with at least 60% in the Grade 12 examination
Contact time	1 discussion class per week, 4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

SI-units. Significant figures. Waves: intensity, superposition, interference, standing waves, resonance, beats, Doppler. Geometrical optics: Reflection, refraction, mirrors, thin lenses, instruments. Physical optics: Young-interference, coherence, diffraction, polarisation. Hydrostatics and dynamics: density, pressure, Archimedes' principle, continuity, Bernoulli. Heat: temperature, specific heat, expansion, heat transfer. Vectors. Kinematics of a point: Relative, projectile, and circular motion. Dynamics: Newton's laws, friction. Work: point masses, gasses (ideal gas law), gravitation, spring, power. Kinetic energy: Conservative forces, gravitation, spring. Conservation of energy. Conservation of momentum. Impulse and collisions. System of particles: Centre of mass, Newton's laws. Rotation: torque, conservation of angular momentum, equilibrium, centre of gravity.

First course in physics 124 (PHY 124)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Applied Mathematics BSc Chemistry BSc Extended programme - Physical Sciences BSc Geography BSc Mathematics BSc Meteorology BSc Physics

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	WTW 114 GS and PHY 114 GS
Contact time	4 lectures per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Simple harmonic motion and pendulums. Coulomb's law. Electric field: dipoles, Gauss' law.Electric potential. Capacitance. Electric currents: resistance, resistivity, Ohm's law, energy, power, emf, RC-circuits. Magnetic Field: Hall-effect, Bio-Savart. Faraday's and Lenz's laws. Oscillations: LR-circuits. Alternating current: RLC-circuits, power, transformers. Introductory concepts to modern physics. Nuclear physics: Radioactivity.

Physics for biology students 131 (PHY 131)

Qualification	Undergraduate
Module credits	16.00
Programmes	BPhysio BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Ecology BSc Entomology BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science
Prerequisites	A candidate must have passed Mathematics with at least 60% in the Grade 12 examination
Contact time	1 discussion class per week, 1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English

Department	Physics
Period of presentation	Semester 1

Module content

Units, vectors, one dimensional kinematics, dynamics, work, equilibrium, sound, liquids, heat, thermodynamic processes, electric potential and capacitance, direct current and alternating current, optics, modern physics, radio activity.

Physics 133 (PHY 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	Admission to the relevant programme.
Contact time	2 practicals per week, Foundation Course, 2 discussion classes per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Heat: temperature and scales, work, energy and heat, calorimetry, specific heat, expansion, heat transfer. Measurements: SI-units, measuring error and uncertainty, (graphs), significant figures, mathematical modelling.One-dimensional kinematics. Geometrical optics: reflection, refraction, dispersion, mirrors, thin lenses.

General physics 141 (PHY 141)

Qualification	Undergraduate
Module credits	16.00
Service modules	Faculty of Health Sciences
Prerequisites	PHY 131 GS as well as 50% minimum for the practical component of PHY 131 or permission from the HOD.
Contact time	2 tutorials per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

*This is an anti-semester presentation of the module PHY 131 General Physics 131. Refer to PHY 131 for the content description. Students will not be credited for both PHY 131 and PHY 141 for degree purposes.

Physics 143 (PHY 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	PHY 133
Contact time	Foundation Course, 2 practicals per week, 2 discussion classes per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Vectors. Kinematics of a point: relative motion, projectile, circular motion. Dynamics: Newton’s laws, friction. Work: point masses, ideal gas law, springs, power. Energy: kinetic energy, potential energy, conservative forces, spring, conservation of mechanical energy. Hydrostatics and dynamics: density, pressure, Archimedes' law, continuity, Bernouli.

Physics 144 (PHY 144)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences
Service modules	Faculty of Education
Prerequisites	PHY 133
Contact time	Foundation Course, 1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

The main topics covered in this module are Mechanics and Thermodynamics. Kinematics: Basic types of motion, one-dimensional motion, two- and three dimensional motion, linear momentum and its conservation, multi-object systems and the centre of mass.
Forces: Types of forces, Newton's Laws of Mechanics and applications, friction.
Energy: Work, heat, conservation of mechanical energy.
Thermodynamics: First law of thermodynamics, empirical gas laws, mechanical model of the ideal gas, energy of the ideal gas, basic thermodynamic processes.

Physics 153 (PHY 153)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	PHY 143
Contact time	Foundation Course, 2 practicals per week, 2 discussion classes per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

System of particles: centre of mass, Newton's laws. Rotation: torque, conservation of momentum, impulse and collision, conservation of angular momentum, equilibrium, centre of gravity. Oscillations. Waves: sound, intensity, superposition, interference, standing waves, resonance, beats, Doppler effect. Physical optics: Young-interference, coherence, thin layers, diffraction, gratings, polarisation.

Physics 154 (PHY 154)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences
Service modules	Faculty of Education
Prerequisites	PHY 143
Contact time	1 practical per week, Foundation Course, 4 lectures per week
Language of tuition	Module is presented in English
Department	Physics

Period of presentation	Semester 1

Module content

The main topic in this module is Electricity, Sound, Optics, and Modern Physics.
Static Electricity: Electric charge and force, electric field, the electric energy, electric potential, conservation of electrical energy.
Flow of charge: Capacitors, application of charge flow to nerves.
Sound: Vibrations, waves in unconfined and confined media, applications to human hearing.
Optics: Reflection, refraction, applications to optometry and ophthalmology.
Atomic physics: Atomic models, x-rays.
Nuclear physics: The stable atomic nucleus, radioactivity, nuclear spin and applications to medical diagnostics.

Astronomy for physicists 210 (PHY 210)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Physics BSc Physics
Prerequisites	PHY 114, PHY 124
Contact time	1 discussion class per week, 4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Introduction to the universe: distance and time scales. Solar System overview. Techniques of astronomy: telescopes and optics, basic radio receiver. Solar system: gas giants, terrestrial planets, small bodies. Stellar evolution and death. Interstellar medium: gas, dust, molecules and masers. Supernova and Pulsars: galaxies and the Milky Way, galactic evolution and classification. Quasars, apparent superluminal motion, black holes. Big Bang, and the age of the universe. Expansion of the universe. SKA, MeerKAT, SALT, HESS and history of astronomy in SA. Other current topics in astronomy.

Waves, thermodynamics and modern physics 255 (PHY 255)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Geology BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Education

Prerequisites	[PHY114 and PHY124] or [PHY171] or [PHY143 and PHY153 and PHY163] and [WTW211#] and [WTW218#]
Contact time	4 lectures per week, 1 practical per week, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Vibrating systems and waves (14 lectures)
Simple harmonic motion (SHM). Superposition (different frequencies, equal frequencies). Perpendicular vibrations (Lissajous figures). Damped SHM. Forced oscillations. Resonance. Q-value. Transverse wave motion. Plane wave solution using method of separation of variables. Reflection and transmission at a boundary. Normal and eigenmodes. Wave packets. Group velocity.
Modern physics (30 lectures)
Special relativity: Galilean and Lorentz transformations. Postulates. Momentum and energy. 4 vectors and tensors. General relativity. Quantum physics. Failure of classical physics. Bohr model. Particle-wave duality. Schrödinger equation. Piece-wise constant potentials. Tunneling. X-rays. Laser. Nuclear physics: Fission. Fusion. Radioactivity.
Heat and thermodynamics (12 lectures)
Heat. First Law. Kinetic theory of gases. Mean free path. Ideal, Clausius, Van der Waals and virial gases. Entropy. Second Law. Engines and refrigerators. Third Law. Thermodynamic potentials: Enthalpy Helmholtz and Gibbs free energies, Chemical potential. Legendre transformations (Maxwell relations). Phase equilibrium. Gibbs phase rule.
Modelling and simulation (7 practical sessions)
Introduction to programming in a high level system: Concept of an algorithm and the basic logic of a computer programme. Symbolic manipulations, graphics, numerical computations. Applications: Selected illustrative examples.
Error Analysis (7 practical sessions)
Experimental uncertainties. Propagation of uncertainties. Statistical analysis of random uncertainties. Normal distribution. Rejection of data. Least-squares fitting. Covariance and correlation.

General physics 263 (PHY 263)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Geology BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Education
Prerequisites	PHY 255 GS and WTW 218 GS and WTW 220# and WTW 248#
Contact time	1 practical per week, 2 discussion classes per week, 4 lectures per week

Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Classical mechanics (28 lectures)
Fundamental concepts, energy and angular momentum, calculus of variations and Lagrangian mechanics, conservative central forces and two body problems, scattering, mechanics in rotating reference frames, many body systems.
Physical Optics (14 lectures)
Maxwell’s equations, wave equation and plane wave solution, coherence, interference, diffraction, polarisation.
Physics of Materials (14 lectures)
Classification of materials. Atomic bonding. Crystallography. Defects. Material strength. Phase diagram's, Ceramics. Polymers. Composites. Fracture. Electrical and magnetic properties. Semiconductors. Smart materials Nanotechnology.
Experiments (14 sessions)

Observational astronomy 300 (PHY 300)

Qualification	Undergraduate
Module credits	36.00
Programmes	BSc Physics BSc Geology BSc Physics
Prerequisites	PHY 255 and PHY 263
Contact time	2 discussion classes per week, 4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Structure of the universe, navigation of the sky, spherical geometry, optical, radio and high energy physics and sources, instruments, practical observational skills, data recording, analysis, interpretation (signal and image processing, noise, calibration, error analysis). Project: A selected project in either optical or radio astronomy, resulting in a formal report and a presentation.

Particle and astroparticle physics 310 (PHY 310)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics BSc Physics
Prerequisites	PHY 255 and PHY 263 and PHY 356

Contact time	1 practical per week, 1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Relativistic kinematics, fundamentals of elementary particle physics, the four forces of nature and the Standard Model, beyond the Standard Model, early universe cosmology (inflation, baryogenesis), the Cosmic Microwave Background, high-energy astronomy (cosmic rays, gamma rays and neutrinos), gravitational waves, dark matter (evidence, candidates, detection), dark energy and the Standard Cosmological Model.

Physics project 353 (PHY 353)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Physics
Prerequisites	Permission from the HOD.
Contact time	3 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

*Cannot be used as substitute for other Physics 300 modules to obtain admission to the BSc(Hons) in Physics. A student is required to complete a project under guidance of the lecturer. The nature of the project is determined jointly by the student, lecturer and the head of department.

Electronics, electromagnetism and quantum mechanics 356 (PHY 356)

Qualification	Undergraduate
Module credits	36.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Geology BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Education
Prerequisites	PHY 255 GS and PHY 263 GS and WTW 211 GS and WTW 218 GS and WTW 248 GS
Contact time	4 lectures per week, 1 practical per week, 2 discussion classes per week
Language of tuition	Module is presented in English

Department	Physics
Period of presentation	Semester 1

Module content

Electronics (14 lectures)
Thévenin and Norton equivalent circuits, superposition principle, RC, LC and LRC circuits. Semiconductor diode. Bipolar transistor. Operational amplifiers. Computer controlled instrumentation.
Electromagnetism (21 lectures)
Electrostatics: Coulomb's law, divergence and curl of E, Gauss' law, Laplace's equation, image charge problems, multipole expansion.
Magnetostatics: Lorenz force, Biot-Savart law, divergence and curl of magnetic field strength, Ampère's law, magnetic vector potential, multipole expansion, boundary conditions.
Electrodynamics: Electromotive force, electromagnetic induction, Maxwell's equations, wave equation.
Electric and magnetic fields in matter: Polarisation, electric displacement and Gauss's law in dielectrics, linear dielectrics. Magnetisation (diamagnets, paramagnets, ferromagnets), auxiliary field H and Ampère's law in magnetised materials, linear and nonlinear media.
Quantum mechanics (28 lectures)
The Schrödinger equation, the statistical interpretation of the wave function, momentum, the uncertainty principle, the time-independent Schrödinger equation, stationary states, the infinite square well potential, the harmonic oscillator, the free particle, the Delta-Function potential, the finite square well potential, Hilbert spaces, observables, eigen functions of a Hermitian operator, Dirac notation, the Schrödinger equation in spherical coordinates, the hydrogen atom, angular momentum spin.

Physics project 363 (PHY 363)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Physics
Prerequisites	TDH
Contact time	3 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

*Cannot be used as substitute for other Physics 300 modules to obtain admission to the BSc(Hons) in Physics
A student is required to complete a project under guidance of the lecturer. The nature of the project is determined jointly by the student, lecturer and the head of department.

Statistical mechanics, solid state physics and modelling 364 (PHY 364)

Qualification	Undergraduate
Module credits	36.00

Programmes	BSc Meteorology BSc Applied Mathematics BSc Geology BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Education
Prerequisites	PHY 356 and WTW 211 and WTW 218 and WTW 248 GS
Contact time	2 practicals per week, 2 discussion classes per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Statistical mechanics (28 lectures)
Isolated systems in thermodynamical equilibrium. Systems in equilibrium with a heat bath: the canonical ensemble, Gibbs' entropic formula, classical statistical mechanics, energy equipartition theorem, thermodynamic potentials, paramagnetism.
The classical limit of perfect gases: non-distinguishable character of quantum particles, the equation of state of the classical ideal gas. Quantum perfect gases: Black body radiation, the grand canonical ensemble, Fermi-Dirac distribution, the free electron gas in metals, the Bose-Einstein distribution, Bose-Einstein condensation.
Solid state physics (28 lectures)
Crystal structures, the reciprocal lattice, x-ray diffraction, lattice vibration, the Debye model, characteristics of solids, the free electron model, Pauli paramagnetism, electronic heat capacity, the relaxation time, electrical conduction, the classical Hall effect, thermal conduction in metals, failures of the free electron model, the independent electron model, band theory of solids.
Computational Physics and modelling. Assessment will be done through a portfolio of project reports. The topics for the projects will be selected from various sub-disciplines of Physics.

Mathematical methods 701 (PHY 701)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

The purpose of this course is twofold: (1) To refresh and systematize your knowledge of mathematics (sequences, series, vector calculus, functions of many variables etc.); (2) To give you working knowledge of mathematical methods that were not (or not sufficiently) covered in the underground courses, such as Fourier series and transforms; Ordinary and partial differential equations; Abstract vector spaces; Operators and their eigenvectors; Complex analysis; Calculus of variations; Integral equations; Group theory; Probability and statistics; Numerical methods.

Classical mechanics 702 (PHY 702)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Lagrangian dynamics: Lagrange's equations, d'Alembert's principle, energy, applications, the tangent bundle, action, symmetry, conservation, Noether's Theorem, linear oscillations, normal modes.
Hamiltonian dynamics: Hamilton's equations, symplectic notation, phase space, Liouville's Theorem, Poisson brackets, canonical transformations, generating functions, the Hamilton-Jacobi equation. Elementary Lagrangian field theory.

Quantum mechanics 703 (PHY 703)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Origins of quantum mechanics; Mathematical tools; Postulates and quantization; Conservation laws; One-dimensional problems; Linear harmonic oscillator; Three-dimensional problems; Angular momentum; Hydrogen atom; Addition of angular momenta; Spin; Approximate methods (WKB, variational approach, time-independent perturbations); Time-dependent perturbations; Scattering; Partial wave scattering; Identical particles; Hartree-Fock approach; Many-body problems and quantum statistics; Second quantisation; Relativistic equations.

Statistical physics 704 (PHY 704)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Thermodynamic behaviour of an ideal Bose gas: Bose-Einstein functions, the virial expansion, the Riemann zeta-function, Bose-Einstein condensation. Phonons: the field of sound waves, inertial density of the sound field, elementary excitations in liquid helium II. Ideal Fermi systems: thermodynamic behaviour of an ideal Fermi gas, Fermi-Dirac functions and their relation to Bose-Einstein functions, the virial expansion, the Fermi energy, asymptotic expansions at low temperature, magnetic behaviour of an ideal Fermi gas (Pauli paramagnetism, Landau diamagnetism). Quantised fields: free bosonic quantum fields, interacting quantum fields, interacting Hamiltonian, interactions in terms of creation and annihilation operators, imperfect Bose gasses at low temperature, fermionic quantum fields, interacting theory, the ground state of an imperfect Fermi gas. Phase transition in the Ising model: mean field theory, critical exponents.

Electrodynamics 705 (PHY 705)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Conservation laws in electrodynamics; electromagnetic waves in vacuum, dielectrics, conductors and wave guides; potentials and fields, guage transformations, Liénard-Wiechert potentials; electric and magnetic dipole radiation, radiation by a point charge; relativistic electrodynamics.

Project and seminar 706 (PHY 706)

Qualification	Postgraduate
Module credits	25.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English

Department	Physics
Period of presentation	Year

Module content

A theoretical or an experimental project can be selected. The project must be approved by the head of department. The project must be summarised in the form of a written report and presented at an open seminar.

Many body physics 708 (PHY 708)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Second quantisation. Coherent states. Single particle behaviour. Hartree-Fock – perturbation – linearisation of operators. Quasi-particles, effective mass and applications: atom physics, electron gas, one dimensional delta function. Collective behaviour. Tamm- Dancoff approximation: linearisation. Time dependent Hartree-Fock. Random phase approximation. Applications: giant dipole resonance, screening in an electron gas, correlation energy in an electron gas, plasma oscillations, zero sound. Canonical transformation – Cooper pairs, BSC theory. Thomas-Fermi theory. Density functional theory. Superconduction. Ginzberg-Landau theory. Zero field finite temperature BCS.

Numerical physics 710 (PHY 710)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Numerical nature of physical problems such as atomic structure, electric fields, harmonic oscillators (classic and quantum mechanics), heat conduction, hydrodynamics, Ising model, molecular vibrations, order and chaos, potential scattering, Schrödinger equation, wave equation.

Solid state physics 711 (PHY 711)

Qualification	Postgraduate

Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Electronic band structure, vibration properties of solids, electronic properties of defects, electric transport, optical properties, quantum confinement.

Quantum optics 712 (PHY 712)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Coherent states of free and forced oscillators. Semi-classical electrodynamics (including time dependent perturbations and stimulated transitions). Mode composition of the electromagnetic field. Properties of laser light. Resonators and modes. Laser types (ruby, Nd-YAG, Carbondioxide, He-Ne, excimer and GaAs).

Electronic materials 713 (PHY 713)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	6 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Structure, electrical and optical properties of semiconductors; semiconductor metal contacts; Ohmic and Schottky contacts; influence of impurities and defects on properties of the contacts; quantum well semiconductor structures.

Analytical physics 714 (PHY 714)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Review of surface analytical techniques, surface structure determinations, surface topography techniques, theory of contrast in electron microscopy; electron microscopic surface and interface techniques; scanning tunnelling microscopy; electrical and electro-optical characterisation of semiconductors; determination of defects and impurities in semiconductors; propagation of laser rays; photoluminescence.

Nuclear solid state physics 715 (PHY 715)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Mössbauer effect; positron annihilation; perturbed angular correlations; neutron scattering; RBS; channeling; nuclear reaction analyses.

Group theory 716 (PHY 716)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Introduction to group theory needed in physics. Thirty-two crystallografic point groups; selected groups; full rotation groups; applications such as classification of spectral terms; selection rules; Clebs-Gordon coefficients.

Quantum field theory 717 (PHY 717)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	Admission only by permission of the Head of the Department of Physics
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Special relativity. Representation of transformations in quantum physics. Canonical quantisation of free scalar fields. Interactions, scattering and the reduction formula. Path integrals in quantum mechanics; the harmonic oscillator. Free fields. Interacting fields, perturbation theory and Feynman diagrams. Scattering amplitudes and the Feynman rules. Renormalisation: Dimensional analysis, the exact propagator, the exact three point vertex, higher order corrections and perturbation theory to all orders. Symmetry: Continuous symmetries and conserved currents, discrete symmetries. The renormalisation group: Infrared divergences, different renormalisation schemes and asymptotic freeness, the renormalisation group. Spontaneous symmetry breaking: A discrete example, a continous example, the Goldstone boson.

Experimental physics 718 (PHY 718)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	2 practicals per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Guided experiments designed to expose students to modern experimental techniques, leading to a report written in the format of a research article.

Nuclear physics 719 (PHY 719)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	Admission only with permission by the Head of the Department of Physics

Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Quarks, Nucleons, Isobaric Invariance, NN-interaction, Two-nucleeon system, Deuteron, Elements of scattering theory, NN-scattering, Few-body nuclear systems, General properties of medium and heavy nuclei, Nuclear models, Radioactivity, Nuclear reactions, ?-, ?-, and ?-decays, Nuclear fission, Nuclear fusion, nuclear astrophysics.

Radio astrophysics 720 (PHY 720)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	Completion of the core components of the BScHons
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Goals and techniques of modern radio astronomy, studies of galaxies and interstellar medium, radiation mechanisms, neutral hydrogen, astro-chemistry, masers, supernovae, pulsars and transient phenomena, high red-shift universe, quasars. Radio receivers and techniques.

Foundations of physics 781 (PHY 781)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Conceptual basis of physics: The nature of Laws of Physics, basic concepts and misconceptions. Nature of physics, its history, nature of evidence, paradigms, current views and controversies of the nature of the physics enterprise. Indigenous knowledge in the field of physics, and alternative world views, physics in society. Limits and abuses of the results of Modern Physics.

Current trends in physics 782 (PHY 782)

Qualification	Postgraduate
Module credits	10.00
Prerequisites	Completion of core components of the BScHons
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

A chosen field of physics that is linked to the research specialisations of groups within the Physics Department. Approaches and trends in research advances in new topics in physics. The module follows a format of guided advanced readings, seminars and discussion sessions.

Introduction to crop protection 251 (PLG 251)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Plant Science BSc Biotechnology BSc Ecology BSc Plant Science BSc Zoology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Development and importance of crop protection. Basic principles in crop protection i.e. epidemic development of disease and insect pest populations, ecology of plant diseases and abiotic factors that affect plant health i.e. environmental pollution and pesticides, nutrient deficiencies and extreme environmental conditions. Ecological aspects of plant diseases, pest outbreaks and weed invasion. Important agricultural pests and weeds. Life cycles of typical disease causing organisms. Basic principles of integrated pest and disease management.

Principles of plant pathology 262 (PLG 262)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Plant Science BSc Biotechnology BSc Ecology BSc Genetics BSc Microbiology BSc Plant Science BSc Zoology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	MBY 161
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Fundamental principles of plant pathology. The concept of disease in plants. Causes of plant diseases. Stages in development of plant diseases. Disease cycles. Diagnosis of plant diseases.

General plant pathology 351 (PLG 351)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Plant Science BSc Biotechnology BSc Genetics BSc Microbiology BSc Plant Science BScAgric Plant Pathology
Prerequisites	MBY161, MBY261 and PLG262
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Principles and examples of plant diseases and their socio-economic importance. Current trends in plant pathology such as biosecurity, sanitory and phytosanitary issues of trade. Risk assesment and international food safety standards. The use of global information systems to assess disease spread and impact of global warming. Supply chain analysis, postharvest technology and food trade aspects.

Plant disease control 363 (PLG 363)

Qualification	Undergraduate

Module credits	18.00
Programmes	BSc Plant Science BSc Biotechnology BSc Genetics BSc Plant Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	PLG 251 or PLG 262 or permission from the HOD. MBY 261 is recommended.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Principles of plant disease control. Non-chemical control including biological control, disease resistance, regulatory measures, cultivation practices, physical methods. Modern chemo-therapy: characteristics, mode of action and application of fungicides, bactericides and nematicides. Principles of integrated disease management.

Host pathogen interactions 364 (PLG 364)

Qualification	Undergraduate
Module credits	18.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Includes fungal, bacterial and viral interactions. Focuses on molecular and cellular events occurring during recognition, during fungal evasion of the host's defence mechanisms and during disease symptom development. Topics discussed will also include cell biology of interactions, systemic acquired resistance and the role of pathogenesis related proteins and toxins in pathogenesis. Basic aspects of plant disease epidemiological theory and concepts. Introduction to equipment and techniques used in epidemiological research as well as practical applications of epidemiology in plant disease management.

Research project 462 (PLG 462)

Qualification	Undergraduate
Module credits	28.00
Programmes	BScAgric Plant Pathology BScAgric Plant Pathology
Prerequisites	No prerequisites.

Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

A practical research project of limited extent under the supervision of one of the lecturers in plant pathology within the department. Any topic in plant pathology can be selected.

Plant disease epidemiology 463 (PLG 463)

Qualification	Undergraduate
Module credits	18.00
Programmes	BScAgric Plant Pathology BScAgric Plant Pathology
Prerequisites	PLG 251, PLG 262 and PLG 363
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Understanding of how plant disease epidemics occur in nature and how they can be monitored and analysed. In-depth knowledge how of plant diseases cause crop losses, how these losses are quantified, and how losses are predicted. Examples of how epidemiology is used to set the strategy of plant disease control. Use of some statistical procedures for quantifying and comparing epidemics. Impact of climate change on plant disease development. In-depth discussions on plant-pathogen interactions and plant defence mechanisms.

Advanced plant disease control 483 (PLG 483)

Qualification	Undergraduate
Module credits	18.00
Programmes	BScAgric Plant Pathology BScAgric Plant Pathology
Prerequisites	PLG 363 or permission from the HOD.
Contact time	2 discussion classes per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Advanced aspects of chemical and biological control of plant diseases as well as disease resistance.

Current concepts in plant pathology 490 (PLG 490)

Qualification	Undergraduate
Module credits	18.00
Programmes	BScAgric Plant Pathology BScAgric Plant Pathology
Prerequisites	Third-year status or permission from the HOD.
Contact time	1 seminar per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

This module will address the most recent concepts in plant pathology.

Parametric stochastic processes 720 (PNP 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	WST 312
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Introduction to statistical measure theory. Queueing processes: M/M/1; M/M/S; M/G/1 queues and variants; limiting distribution of the queue length and waiting times. Queuing networks. Some stochastic inventory and storage processes.

Sustainable crop production and agroclimatology 251 (PPK 251)

Qualification	Undergraduate
Module credits	15.00

Programmes	BSc Plant Science BSc Biotechnology BSc Environmental Sciences BSc Plant Science BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Prerequisites	BOT 161
Contact time	fortnightly practicals, 3 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Influence of climate on cropping systems in South Africa. The surface energy balance. Hydrological cycles and the soil water balance. Sustainable crop production. Simple radiation and water limited models. Potential yield, target yield and maximum economic yield. Crop nutrition and fertiliser management. Principles of soil cultivation and conservation. Climate change and crop production – mitigation and adaptation.

Plant production: Herbicides and control 712 (PPR 712)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

Weeds and their importance in Southern Africa. Properties and uses of herbicides.
Herbicides in soils and their mode of action in plants.

Agroforestry 713 (PPR 713)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.

Contact time	1 lecture per week, 1 discussion class per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Agro-ecological zones (climate and soil); trees for fruit, fodder, fuel and/or timber; intercropping or alley cropping with grains, vegetables or pastures; management (including aspects such as nursery production, establishment, fertilization, pest control) and utilization/marketing.

Dissertation: Plant pathology 890 (PPT 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Plant Pathology MSc Plant Pathology MScAgric Plant Pathology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Mini-dissertation: Plant protection 892 (PPT 892)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Each candidate must write a mini-dissertation on his/her project in plant protection. The mini-dissertation can be either factor- or strategic research and case studies. The candidate must have at least one paper submitted to a peer-reviewed journal.

Thesis: Plant pathology 990 (PPT 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Plant Pathology PhD Plant Pathology

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Poultry nutrition and production 420 (PVK 420)

Qualification	Undergraduate
Module credits	18.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	VGE 320 and VKU 250
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Specialised nutrition of poultry in different physiological stages and production systems. Industrial science and management of production systems and feeding systems in poultry production units. Applied breeding of poultry. Design and utilisation of equipment and housing facilities. Product quality and marketing of poultry products. Hygiene and health programmes. Practical work: The use of computer systems in feeding management of poultry in different production systems. Management of different poultry production systems.

Poultry science 800 (PVK 800)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Specialised study of the management of hatcheries, broiler and layer production units, broiler breeding parent farms, ostriches, cage bird, game bird and waterfowl units, as well as threatened species in conservation programmes. Planning of production units and facilities. Determining ventilation requirements, disease control and biosecurity systems. Product quality, marketing and promotion of birds and their products. Computer aided management systems and product projection. Execution of projects in certain areas of specialisation. Studies aimed at optimising production efficiency and minimising risk.

Regression analysis 780 (RAL 780)

Qualification	Postgraduate
Module credits	15.00
Programmes	BComHons Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	STK 310 and STK 320
Contact time	1 lecture per week, 1 web-based period per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Matrix methods in statistics. Simple and multiple regression models. Sums of squares of linear sets. Generalised t- and F-tests. Residual analysis. Diagnostics for leverage, influence and multicolinearity. Indicator variables. Regression approach to analysis of variance. Weighted least squares. Theory is combined with practical work.

Research project 310 (RCH 310)

Qualification	Undergraduate
Module credits	20.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	3rd-year status
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Human Nutrition
Period of presentation	Semester 1

Module content

Research methods and process.

Research project 320 (RCH 320)

Qualification	Undergraduate
Module credits	10.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	RCH 310
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Human Nutrition

Period of presentation	Semester 2

Module content

Literature study, protocol and statistics (1 l + 1 x 2h discussion).
Preparation of protocol and submission for approval (1 x 2h discussion).

Social research: Introductory methodology 210 (RES 210)

Qualification	Undergraduate
Module credits	20.00
Programmes	BA Languages
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Psychology
Period of presentation	Semester 1

Module content

The module introduces methods of inquiry in the social sciences and humanities. The purpose of this module is to introduce students to the research process in order to equip them with the necessary competence to:
• identify social problems, formulate research questions and hypotheses;
• have a basic understanding of writing the literature review and research proposal;
• know and select relevant methods of inquiry;
• be aware of the necessity of conducting ethically sound research; and
• interpret and present data graphically.

Social research: Methodological thinking 320 (RES 320)

Qualification	Undergraduate
Module credits	30.00
Programmes	BA
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	RES 210
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Psychology
Period of presentation	Semester 2

Module content

The module introduces methods of inquiry in the social sciences and humanities. The purpose of this module is to introduce students to the research process in order to equip them with the necessary competence to:
identify social problems, formulate research questions and hypotheses;
have a basic understanding of writing the literature review and research proposal;
know and select relevant methods of inquiry;
be aware of the necessity of conducting ethically sound research; and
interpret and present data graphically.

Radiation physics 110 (RFI 110)

Qualification	Undergraduate
Module credits	10.00
Programmes	BRad Diagnostics
Service modules	Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Module content

Units: converting, dimensional analysis. Mechanics: momentum, force, energy, circular motion, moment of inertia, angular momentum, simple harmonic motion.
Electrostatics: Coulomb's law, electric field, potential. Direct currents: resistors, Ohm's law. Capacitors: capacitance, series, parallel energy. Magnetism: force on a moving charge, electric motor. Electromagnetic induction: Faraday's law, Lenz's Law, generators. Alternating currents: average and rms value, three phase, rectification, transformers. Electrical safety. Atomic structure: ionization, excitation.
X-rays: production, absorption.

Radiation physics 210 (RFI 210)

Qualification	Undergraduate
Module credits	10.00
Programmes	BRad Diagnostics
Service modules	Faculty of Health Sciences
Prerequisites	RFI 110, MTL 180, RAN 100, FSG 161, FSG 162, RAW 182 and RAW 180
Contact time	3 lectures per week
Language of tuition	Module is presented in Afrikaans
Department	Physics
Period of presentation	Semester 1

Module content

X-ray generator: transformer, energy losses, rectifiers, capacitor-discharge systems, kVp and mA control, high voltage cables. Image intensifiers: design, brightness gain, coupling systems. TV camera and monitor: design, video signal, scanning. Image quality. Optics: reflection, refraction, total internal reflection, mirrors, lenses, thin lens formula, lens aberrations, fibre optics, lasers, laser camera. Computers: basic hardware, digital principles and terminology, data storage.

Radiation physics 211 (RFI 211)

Qualification	Undergraduate
Module credits	10.00
Programmes	BRad Diagnostics
Service modules	Faculty of Health Sciences
Prerequisites	RFI 110, RAW 180, RAN 100, FSG 161, FSG 162, RAW 182 and MTL 180
Contact time	4 lectures per week
Language of tuition	Module is presented in Afrikaans
Department	Physics
Period of presentation	Semester 2

Module content

Radio-active decay: half-life, alfa decay, beta decay, gamma decay. Production of isotopes cyclotron, nuclear reactor, Van de Graaff accelerator. Absorption: nucleons, alfa particles, beta particles. Dosimetry: exposure, absorbed dose, equivalent dose, effective dose, dose limits. Radiation detectors: Geiger counter, scintillation counter, thermoluminescent detector, semi-conductor detectors. Radiopharmaceuticals. Biological effects: genetic and somatic effects.

Radiation physics 310 (RFI 310)

Qualification	Undergraduate
Module credits	10.00
Programmes	BRad Diagnostics
Service modules	Faculty of Health Sciences
Prerequisites	FSG 251, RFI 210, RAW 281, RBG 281, RAN 280, RAW 282, FSG 252, FSG 262, RAW 284 and RFI 211
Contact time	3 lectures per week
Language of tuition	Module is presented in Afrikaans
Department	Physics
Period of presentation	Semester 1

Module content

Computed tomography: CT generations. Equipment: x-ray tube, collimators, detectors. Image reconstruction: fundamental equations, algorithms.
Image properties: field size, image matrix, voxel, pixel, CT number, window width and height. Image quality: spatial resolution, contrast resolution, quantum mottle, spatial uniformity and frequency. Image processing: edge enhancement, pixel shifting and subtraction. Digital radiography: X-ray, equipment, analogue to digital conversion, linear and logarithmic subtraction, image noise. Ultrasound: theory, transducers, piezo-electric crystals, resonant frequency, interaction with matter, acoustic impedance, Doppler techniques. Magnetic resonance: medical applications.

Reproduction science 310 (RPL 310)

Qualification	Undergraduate
Module credits	8.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	DAF 200
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Theriogenology, spermatogenesis, zoogenesis, the female sexual cycle. Species differences. Hormonal control of the sexual functions.

Reproduction science 320 (RPL 320)

Qualification	Undergraduate
Module credits	10.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	RPL 310
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Artificial insemination. Semen collection techniques, the evaluation, dilution and conservation of semen. Collection, conservation and transfer of embryos. Collection of ova and in vitro fertilization. Handling of apparatus and practical insemination, oestrus observation and determination of gestation.

Small animal medicine and surgery 410 (SAS 410)

Qualification	Undergraduate
Module credits	21.00
Programmes	BVSc
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 practicals per year, 9 lectures per week
Language of tuition	Module is presented in English
Department	Companion Animal Clinical Studies
Period of presentation	Semester 1

Module content

Patient assessment; therapeutic and monitoring plans for selected key critical situations; identification, diagnosis and treatment of important cardiovascular, respiratory, kidney, skin, endocrine and eye conditions/diseases; multi-systemic conditions; dentistry; oncology; behaviour-related disorders and treatment, critical care and traumatology in dogs and cats.

Small animal medicine and surgery 420 (SAS 420)

Qualification	Undergraduate
Module credits	21.00
Programmes	BVSc
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	9 lectures per week, 2 practicals per year
Language of tuition	Module is presented in English
Department	Companion Animal Clinical Studies
Period of presentation	Semester 2

Module content

Patient assessment; therapeutic and monitoring plans for selected key critical situations; identification, diagnosis and treatment of important gastrointestinal, liver, pancreas, peritoneal, urogenital, skin, musculoskeletal, nervous system; dentistry in dogs and cats.

Religious instruction 171 (SCE 171)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week

Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Prominent religions in South Africa, world views associated with these religions, the cultural role of religions, importance of holy days. Mysticism and the occult.

Science education 201 (SCE 201)

Qualification	Undergraduate
Module credits	16.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Module content

An introduction to patterns of scientific thinking. An introduction to science and science literacy. Ethics of science. Using the scientific method to encourage discovery learning. Exploring the concept of knowledge. The Learning Cycle. Principles of curriculum design.

Science education 303 (SCE 303)

Qualification	Undergraduate
Module credits	36.00
Prerequisites	CIL 111 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Year

Module content

Understanding the application of OBE in the teaching of science. The infusion of scientific thinking into the science curriculum in a developmentally appropriate way. The design of learning programmes by programme organisers at school level. Macro planning in the natural science learning area. Provincial and national models of assessment. The assessment and implementation of learning programmes. The assessment of learner progress in the context of specific science learning programmes. Introduction to the principles of discipline and motivation. Some aspects of school guidance and career planning. Practical: Practical experience with learning opportunities. Use of computers as a teaching aid.

Research methods in science education 881 (SCE 881)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Education (Coursework) MSc Environmental Education (Coursework)
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Semester 1

Module content

The purpose of this course is to:
- Be exposed to the discipline of Educational Research
- Understand research concepts, principles and methods
- Obtain skills such as: the formulation and definition of a research problem, the use of literature to obtain an in depth understanding of a problem, the design of the research protocol, the interpretation of research results to draw conclusions about a research problem.

Statistics for science education 882 (SCE 882)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Semester 1

Module content

The course follows a conceptual approach to the field of statistical principles as applied within educational research. The emphasis lies on understanding selected statistical procedures and the logic underlying statistical deduction. The purpose of the course is to promote statistical literacy as a research tool.

Curriculum development and assessment – Science education 883 (SCE 883)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English

Department	Centre for Science Development
Period of presentation	Semester 1

Module content

The course reviews modern thinking in science content and curriculum development in both a South African and an International context. Assessment is treated as an integral part of curriculum design. Special attention is given to the theoretical principles of assessment, with special reference to accuracy and reliability: The application of these elements to standardised as well as teaching developed tests are reviewed. Finally, new forms of assessment are explored.

Current developments: Science education 884 (SCE 884)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Semester 1

Module content

The objectives of this course are: to explore and discuss the major approaches currently advocated in science education (e.g. constructivist learning) and as they pertain to the nature of the scientific fields; to explore and discuss some current restructuring proposals underway and the consequences of the above proposals for the classroom teacher; to develop a curriculum or curricular units, strategies for the implementation of the curriculum and evaluation strategies consistent with the goals of the new curriculum and evaluation strategies consistent with the goals of the new curriculum; to explore activities, computer software, computer interfaced laboratories, video recordings and integrated technological systems that will support the new curriculum.

Seminar: Science education 885 (SCE 885)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Contact time	1 seminar per week
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Semester 1

Module content

The purpose of the seminar is to contribute and learn from the interaction and research of fellow postgraduate students and professionals. At least 5 presentations on recent literature or your own research in science education or in a science speciality are required. The programme contributes both to the development of the underlying knowledge and research project, but also build a team approach to scientific endeavour, develops and demonstrates scientific presentation skills and scientific reporting and writing.

Dissertation: Science education 890 (SCE 890)

Qualification	Postgraduate
Module credits	180.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Year

Thesis: Science education 990 (SCE 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Science and Mathematics Education PhD Science and Mathematics Education
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Centre for Science Development
Period of presentation	Year

Exploring the universe 154 (SCI 154)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Extended programme - Physical Sciences BSc Geography BSc Meteorology BSc Physics
Prerequisites	Prohibited combination SCI 164
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

Students from all faculties are welcome to join us in our exploration of the universe from an earth-bound perspective. We reflect on the whole universe from the sub microscopic to the vast macroscopic and mankind's modest position therein. To what degree is our happiness determined by stars? Echoes from ancient firmaments - the astronomy of old civilisations. The universe is born with a bang. Stars, milky ways and planets are formed. Life is breathed into the landscape on earth, but is there life elsewhere? The architecture of the universe – distance measurements, structure of our solar system and systems of stars. How does it look like on neighbouring planets? Comets and meteorites. Life cycles of stars. Spectacular exploding stars! Exotica like pulsars and black holes.

Sampling techniques 720 (SFT 720)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BScHons: WST 311, WST 312, WST 321, BComHons: STK 310, 320
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Simple random sampling. Estimation of proportions and sample sizes. Stratified random sampling. Ratio and regression estimators. Systematic and cluster sampling. Complex survey methodology. Handling of nonresponse.

Soil mechanics 311 (SGM 311)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geology BSc Engineering and Environmental Geology BSc Geology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	(SWK 210)
Contact time	1 practical per week, 3 lectures per week, 2 tutorials per week
Language of tuition	Separate classes for Afrikaans and English
Department	Civil Engineering
Period of presentation	Semester 1

Module content

Introduction to soil mechanics. Introduction to clay mineralogy. Mass, volume relationships and phases of soil. Groundwater flow and permeability. Effective stress principles. Suction pressures in saturated as well as partially saturated soil. The Mohr circle and stresses at a point. The Mohr-Coulomb strength theory and the stress-strain properties of soil. The Boussinesq theory. Consolidation theory and soil settlement.

Geotechnical engineering 323 (SGM 323)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Engineering and Environmental Geology
Prerequisites	(SGM 311)
Contact time	1 practical per week, 3 lectures per week, 2 discussion classes per week
Language of tuition	Separate classes for Afrikaans and English
Department	Civil Engineering
Period of presentation	Semester 2

Module content

Application of consolidation theory. Bearing capacity of soil and foundation design, Terzaghi and general methods. Horizontal stresses in soil and design of retaining structures, Rankine and Couloumb’s methods. Slope stability including Bishop’s method of slices. Introduction to site investigation.

Insect diversity: Economic and ecological implications 711 (SIZ 711)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.
Contact time	2 discussion classes per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

Insect classification and the structuring of diversity; economically and ecologically important insect taxa: apterygote and exopterygote insects - silverfish, mayflies, dragonflies, cockroaches, mantids, termites, earwigs, locusts, stick insects, lice, bugs and thrips; endopterygote insects - lacewings, beetles, flies, fleas, butterflies moths, bees, wasps and ants.

Integrated pest management 724 (SIZ 724)

Qualification	Postgraduate
Module credits	20.00
Prerequisites	No prerequisites.

Contact time	2 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

The origin of insect pests; their host crops; threshold values; pest status; insect pest management; biological-, cultural- and chemical control of insects; insect herbivores as weed biocontrol agents; insects as vectors in human and animal disease; non-vector problem insects; control methods in veterinary entomology; conservation, agriculture and human health; beneficial insects; beekeeping; silk production; insects as human and animal food; insects and ecosystems; chemicals and the environment; insects and eco-tourism.

Psychology 110 (SLK 110)

Qualification	Undergraduate
Module credits	12.00
Programmes	BPhysio BSc Extended programme - Biological and Agricultural Sciences BSc Human Physiology, Genetics and Psychology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 2 discussion classes per week
Language of tuition	Module is presented in English
Department	Psychology
Period of presentation	Semester 1

Module content

This module is a general orientation to Psychology. An introduction is given to various theoretical approaches in Psychology, and the development of Psychology as a science is discussed. Selected themes from everyday life are explored and integrated with psychological principles. This module focuses on major personality theories. An introduction is given to various paradigmatic approaches in Psychology.

Psychology 120 (SLK 120)

Qualification	Undergraduate
Module credits	12.00
Programmes	BOccTher BSc Extended programme - Biological and Agricultural Sciences BSc Human Physiology, Genetics and Psychology

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 discussion classes per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Psychology
Period of presentation	Semester 2

Module content

This module introduces the student to a basic knowledge and understanding of the biological basis of human behaviour. The module addresses the key concepts and terminology related to the biological subsystem, the rules and principles guiding biological psychology, and identification of the interrelatedness of different biological systems and subsystems. In this module various cognitive processes are studied, including perception, memory, thinking, intelligence and creativity. Illustrations are given of various thinking processes, such as problem solving, critical, analytic and integrative thinking.

Psychology 210 (SLK 210)

Qualification	Undergraduate
Module credits	20.00
Programmes	BPhysio BSc Human Physiology, Genetics and Psychology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	SLK 110, SLK 120(GS)
Contact time	2 discussion classes per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Psychology
Period of presentation	Semester 1

Module content

In this module human development from conception through adolescence to adulthood is discussed with reference to various psychological theories. Incorporated are the developmental changes related to cognitive, physical, emotional and social functioning of the individual and the context of work in adulthood. Traditional and contemporary theories of human development explaining and describing these stages are studied in order to address the key issues related to both childhood and adulthood.

Psychology 220 (SLK 220)

Qualification	Undergraduate

Module credits	20.00
Programmes	BSW BSc Human Physiology, Genetics and Psychology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Health Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	SLK 110, SLK 120(GS) and (RES 210 recommended)
Contact time	2 discussion classes per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Psychology
Period of presentation	Semester 2

Module content

This module is a social-psychological perspective on interpersonal and group processes. Themes that are covered include communication, pro-social behaviour, social influence and persuasion, political transformation, violence, and group behaviour.

Psychology 310 (SLK 310)

Qualification	Undergraduate
Module credits	30.00
Programmes	BSW BSc Human Physiology, Genetics and Psychology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	SLK 210(GS), SLK 220(GS)
Contact time	2 discussion classes per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Psychology
Period of presentation	Semester 1

Module content

Identification of abnormal behaviour in children based on knowledge of normal childhood development; introduction to the study of various models pertaining to abnormal behaviour; understanding and application of basic concepts in child psychopathology. This module also provides an introduction to psychopathology and symptomatology of adult abnormal behaviour. Terminology, definitions of abnormal behaviour, problems in diagnosis, labelling, and myths regarding abnormal behaviour are discussed. Neurosis as a specific mental disorder is studied critically from a multidimensional perspective, including intrapsychic, interpersonal and social-cultural explanations.

Psychology 320 (SLK 320)

Qualification	Undergraduate
Module credits	30.00
Programmes	BSW
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	SLK 210 GS, SLK 220 GS, (RES 320 recommended)
Contact time	2 discussion classes per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Psychology
Period of presentation	Semester 2

Module content

This module deals with a community psychological perspective on human behaviour and psychological interventions and also critically explores the contribution of various perspectives in psychology. The module focuses on themes such as definitions of key concepts, principles and aims of community psychology, and the role of the community psychologist as well as the impact of earlier thought frameworks on contemporary perspectives. The implications of these ideas for practical initiatives focussed on mental health in communities, are discussed. The module further focuses on critical psychology. Critical psychology is an orientation towards psychology that is critical towards the assumptions and practices of psychology as it is practiced in the mainstream. It attempts to address power issues as they manifest in the practice of mainstream psychology. The focus is on examining how the practice and theories of mainstream psychology contribute to these power issues impacting on marginalised groups.

Statistical process control 780 (SPC 780)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	STK 310, 320 or WST 311, 312, 321
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Quality control and improvement. Shewhart, cumulative sum (CUSUM), exponentially weighted moving average (EWMA) and Q control charts. Univariate and multivariate control charts. Determining process and measurement systems capability. Parametric and nonparametric (distribution-free) control charts. Constructing control charts using Microsoft Excel and/or SAS. Obtaining run-length characteristics via simulations, the integral equation approach, other approximate methods and the Markov-chain approach.

Statistics 110 (STK 110)

Qualification	Undergraduate
Module credits	13.00
Programmes	BAdmin Public Management and International Relations BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Geoinformatics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	At least 5 (60-69%) in Mathematics in the Grade 12 examination. Candidates who do not qualify for STK 110 must register for STK 113 and STK 123
Contact time	1 practical per week, 1 tutorial per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Descriptive statistics:
Sampling and the collection of data; frequency distributions and graphical representations. Descriptive measures of location and dispersion.
Probability and inference:
Introductory probability theory and theoretical distributions. Sampling distributions. Estimation theory and hypothesis testing of sampling averages and proportions (one and two-sample cases). Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Statistics 113 (STK 113)

Qualification	Undergraduate
Module credits	11.00
Programmes	BAdmin Public Management and International Relations

Service modules	Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 tutorial per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

*On its own, STK 113 and 123 will not be recognised for degree purposes, but exemption will be granted for STK 110.
Data operations and transformations:
Introductory concepts, the role of statistic, various types of data and the number system. Concepts underlying linear, quadratic, exponential, hyperbolic, logarithmic transformations of quantitative data, graphical representations, solving of equations, interpretations. Determining linear equations in practical situations. Characteristics of logarithmic functions. The relationship between the exponential and logarithmic functions in economic and related problems. Systems of equations in equilibrium. Additional concepts relating to data processing, functions and inverse functions, sigma notation, factorial notation, sequences and series, inequalities (strong, weak, absolute, conditional, double) and absolute values.
Descriptive statistics – Univariate:
Sampling and the collection of data, frequency distributions and graphical representations. Descriptive measures of location and dispersion. Introductory probability theory. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.
The weekly one hour practical is presented during the last seven weeks of the semester.

Statistics 120 (STK 120)

Qualification	Undergraduate
Module credits	13.00
Programmes	BAdmin Public Management and International Relations BSc Geoinformatics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	STK 110 GS or both STK 113 GS and STK 123 GS or both WST 133 and WST 143 or STK 133 and STK 143
Contact time	1 practical per week, 3 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Statistics

Period of presentation	Semester 2

Module content

Multivariate statistics:
Analysis of variance, categorical data analysis, distribution-free methods, curve fitting, regression and correlation, the analysis of time series and indices.
Statistical and economic applications of quantitative techniques:
Systems of linear equations: drafting, matrices, solving and application. Optimisation; linear functions (two and more independent variables), non-linear functions (one and two independent variables). Marginal and total functions. Stochastic and deterministic variables in statistical and economic context: producers' and consumers' surplus, distribution functions, probability distributions, probability density functions. Identification, use, evaluation, interpretation of statistical computer packages and statistical techniques.
This module is also presented as an anti-semester bilingual module.

Statistics 121 (STK 121)

Qualification	Undergraduate
Module credits	13.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	STK 133 and STK 143 or WST 133 and WST 143 or STK 113 GS and STK 123 GS
Contact time	3 lectures per week, 1 tutorial per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Students can only get credit for one of the following two modules: STK 120 or STK 121.
Multivariate statistics: Analysis of variance, categorical data analysis, distribution-free methods, curve fitting, regression and correlation, the analysis of time series and indices.
Statistical and economic applications of quantitative techniques: Systems of linear equations: drafting, matrices, solving, application. Optimisation: linear functions (two and more independent variables), non-linear functions (one and two independent variables). Marginal and total functions. Stochastic and deterministic variables in statistical and economic context: producers' and consumers' surplus, distribution functions, probability distributions, probability density functions. Identification, use, evaluation, interpretation of statistical computer packages and statistical techniques.

Statistics 123 (STK 123)

Qualification	Undergraduate
Module credits	12.00
Programmes	BAdmin Public Management and International Relations
Service modules	Faculty of Education Faculty of Humanities Faculty of Natural and Agricultural Sciences

Prerequisites	STK 113 GS
Contact time	3 lectures per week, 1 tutorial per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

*On its own, STK 113 and 123 will not be recognized for degree purposes, but exemption will be granted for STK 110.
Optimisation techniques with economic applications: Data transformations and relationships with economic applications, operations and rules, linear, quadratic, exponential, hyperbolic and logarithmic functions; systems of equations in equilibrium, system of linear inequalities, solving of linear programming problems by means of the graphical and extreme point methods. Applications of differentiation and integration in statistic and economic related problems: the limit of a function, continuity, rate of change, the derivative of a function, differentiation rules, higher order derivatives, optimisation techniques, the area under a curve and applications of definite integrals. Probability and inference: Theoretical distributions. Sampling distributions. Estimation theory and hypothesis testing of sampling averages and proportions (one-sample and two-sample cases). Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. The weekly one hour practical is presented during the last seven weeks of the semester.

Statistics 161 (STK 161)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Construction Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	STK 110 GS or both STK 113 GS and STK 123 GS
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Quarter 3

Module content

*Offered by the Department of Statistics
Multivariate statistics analysis of variance; categorical data analysis; distribution-free methods; curve fitting, regression and correlation; the analysis of time series and indices. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.
This module is also presented as an anti-semester bilingual module.

Statistics 162 (STK 162)

Qualification	Undergraduate

Module credits	7.00
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	STK 110 GS or both STK 113 GS and STK 123 GS
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Quarter 4

Module content

Statistical and economic applications of quantitative techniques Systems of linear equations: Drafting, matrices, solving, application. Optimization: Linear functions (two and more independent variables), non-linear functions (one and two independent variables). Marginal and total functions. Stochastic and deterministic variables in statistical and economic context: Producer and consumer surplus, distribution functions, probability distributions, probability density functions. Identification, use, evaluation, interpretation of statistical computer packages and statistical techniques.
This module is also presented as an anti-semester (quarter 2) bilingual module)

Statistics 210 (STK 210)

Qualification	Undergraduate
Module credits	20.00
Programmes	BCom Informatics Information Systems BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	STK 110, STK 120
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Counting techniques. Probability theory: Sample spaces, events, rules of probability, conditional probabilities, independent events and Bayes' theorem. Probability distributions and probability densities: cumulative distribution functions, marginal distributions, joint distributions, conditional distributions and independence. Expected values: Moments, Chebyshev's theorem, moment-generating functions, product moments, moments of linear combinations of random variables and conditional expectations. Transformation techniques of random variables. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Statistics 220 (STK 220)

Qualification	Undergraduate
Module credits	20.00
Programmes	BCom Informatics Information Systems BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	STK 210 GS
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Special probability distributions: the discrete uniform distribution, Bernoulli distribution, binomial distribution, negative binomial and geometric distribution, the hypergeometric distribution, Poisson distribution and multinomial distribution. Special probability densities: Uniform distribution, gamma, exponential and chi-square distributions, the beta distribution, the normal distribution and the bivariate normal distribution. Functions of random variables. Sampling distributions, point estimation, interval estimation and hypothesis testing. Regression Analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Statistics 310 (STK 310)

Qualification	Undergraduate
Module credits	25.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Humanities Faculty of Natural and Agricultural Sciences
Prerequisites	STK 210, STK 220
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Regression analysis: simple and multiple regression; nonlinear regression; correlation and the use of dummy variables. Multivariate distributions: normal, multinomial and poisson distribution. Linear combinations of normal variables. Analysis of variance and covariance. Regression analysis extensions: heteroscedasticity, serial correlation and lag structures. Applications of matrices, differentiation and integration in the economic and management sciences. Evaluation of simple economic models. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Statistics 320 (STK 320)

Qualification	Undergraduate
Module credits	25.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BSc Mathematical Statistics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211, WST 221 WTW 211 GS and WTW 218 GS OR STK 210, STK 220.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Only one of the modules WST 321 or STK 320 may be included in any study programme. Stationary and non-stationary univariate time series. Properties of autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) processes. Identification, estimation and diagnostic testing of a time series model. Forecasting. Multivariate time series. Practical statistical modelling and analysis using statistical computer packages. Categorical data analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. Student seminars.

The science of data analytics 353 (STK 353)

Qualification	Undergraduate
Module credits	25.00
Programmes	BSc Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Physics BScAgric Agricultural Economics and Agribusiness Management
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	STK 210, STK 220 or WST 211, WST 221

Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Sampling: basic techniques in probability, non-probability, and resampling methods. Designing experiments: experimental and control groups, different data types and relationships. Big and small data: exploring popular trends used in practice. Consultation practice: ethical considerations, study design, data collection and presentation, report writing and presentation. Hands-on application of statistical software and packages to real-life datasets.

Linear mixed models 781 (STK 781)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BScHons and BComHons in Mathematical Statistics: WST 311; BComHons Statistics: STK 310, STK 320.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Specification of linear mixed model, model assumptions, estimation (REML and ML), diagnostics, hypothesis tests, interpretation of parameter estimates, calculating predicted values. Specific models: two- and three-level models for clustered data, intraclass correlation coefficients, repeated measures data, random coefficient models for longitudinal data, models for clustered longitudinal data, models for data with crossed random factors. Using statistical software to analyse LMMs.

Research orientation 796 (STK 796)

Qualification	Postgraduate
Module credits	0.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to the relevant programme.
Contact time	Ad Hoc

Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Module content

A compulsory bootcamp must be attended as part of this module – usually presented during the last week of January each year (details are made available by the department). The bootcamp will cover the basics of research to prepare students for the research component of their degree. The bootcamp should be done in the same year as registration for STK 795/WST 795. Each year of registration for the honours degree will also require the attendance of three departmental seminars. Students should ensure that their attendance is recorded by the postgraduate co-ordinator present at the seminars. The department approves the seminars attended. In addition, students are required to present their STK 795/WST 795 research in the department during the year of registration for these modules.

Capita selecta: Statistics 880 (STK 880)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to the relevant programme.
Contact time	1 lecture per week, 1 other contact session per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

This module covers the most recent literature that discusses current and contemporary research topics in advanced data analytics.

Research orientation 899 (STK 899)

Qualification	Postgraduate
Module credits	0.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to the relevant programme.
Contact time	Ad Hoc
Language of tuition	Module is presented in English

Department	Statistics
Period of presentation	Year

Module content

A compulsory bootcamp must be attended as part of this module – usually presented during the last week of January each year. Details regarding the venue and specific dates are made available by the department each year. The bootcamp will cover the basics of research to prepare students for the research component of their degree. Students can be exempt from the bootcamp if it was already attended in a previous year or for a previous degree. Each year of registration for the master's degree will also require the attendance of three departmental seminars. Students should ensure that their attendance is recorded by the postgraduate co-ordinator present at the seminars. The department approves the seminars attended. Students are also required to present their mini-dissertation research proposal within the department or at a conference.

Research orientation 911 (STK 911)

Qualification	Postgraduate
Module credits	0.00
Programmes	PhD Mathematical Statistics PhD Mathematical Statistics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	No prerequisites.
Contact time	Ad Hoc
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Module content

A compulsory bootcamp must be attended as part of this module – usually presented during the last week of January each year. Details regarding the venue and specific dates are made available by the department each year. The bootcamp will cover the basics of research to prepare the student for the research component of their degree. Students can be exempt from the bootcamp if it has already been attended in a previous year or for a previous degree. Each year of registration for the doctoral degree will also require the attendance of three departmental seminars. Students should ensure that their attendance is recorded by the postgraduate co-ordinator present at the seminars. The department approves the seminars attended.

Surveying 210 (SUR 210)

Qualification	Undergraduate
Module credits	16.00
Prerequisites	No prerequisites.
Contact time	4 practicals per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class

Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Adjustment and use of following instruments: Plane table, level, compass and theodolite. Elementary site surveying and levelling, tachometry. Definition of survey. Co-ordinate systems and bearing. Connections and polars. Methods of determining points. Elevation. Tachometry.

Surveying 220 (SUR 220)

Qualification	Undergraduate
Module credits	14.00
Programmes	BSc Geography BSc Geography BSc Geoinformatics BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 114 GS/WTW 134
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Adjustment and use of following instruments: Plane table, level, compass and theodolite. Elementary site surveying and leveling, tachometry. Definition of survey. Co-ordinate systems and bearing. Connections and polars. Methods of determining points. Elevation. Tachometry.

Mechanics 122 (SWK 122)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Meteorology BSc Engineering and Environmental Geology BSc Extended programme - Physical Sciences BSc Meteorology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WTW 158
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Semester 2

Module content

Equivalent force systems, resultants. Newton's laws, units. Forces acting on particles. Rigid bodies: principle of transmissibility, resultant of parallel forces. Vector moments and scalar moments. Relationship between scalar- and vector moments. Couples. Equivalent force systems on rigid bodies. Resultants of forces on rigid bodies. Equilibrium in two and three dimensions. Hooke's law. Trusses and frameworks. Centroids and second moments of area. Beams: distributed forces, shear force, bending moment, method of sections, relationship between load, shear force and bending moment.

Strength of materials 210 (SWK 210)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geology BSc Engineering and Environmental Geology BSc Geology
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Faculty of Engineering, Built Environment and Information Technology: SWK 122 and WTW 164 OR SWK 122, WTW 161 and WTW 168. Faculty of Natural and Agricultural Sciences: SWK 122 and WTW 124 OR SWK 122, WTW 126 and WTW 128.
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Civil Engineering
Period of presentation	Semester 1

Module content

Stresses, strains and the mechanical properties of materials: Normal stress and shear stress, tension and compression, equilibrium in shear, factor of safety, design, shear strain, stress/strain diagram, Hooke’s Law, Poisson’s Ratio and the shear stress/strain diagram. Axial loads: Elastic deformation, displacements, statically determinate and indeterminate structures and thermal effects. Torsion: Torsion of circular bars and power transmission bending of straight members and composite beams. Transverse shear: Shear in straight members and shear flow. Combined loads: Thin walled pressure vessels and stresses as a result of combined loads. Stress transformation: Plane stress transformation, principle stresses, maximum values and stress variation in prismatic beams. Strain transformation: Plane strain transformation, principle strains, maximum values, strain gauges and rosettes and the relationship between E, G and ?. Design of beams from section characteristics. Deflection of beams: The elastic curve, integration method, Macaulay’s method and superposition.

Tourism and hospitality management 311 (TBE 311)

Qualification	Undergraduate
Module credits	20.00
Programmes	BConSci Hospitality Management
Prerequisites	No prerequisites.

Contact time	2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Division of Tourism Management
Period of presentation	Semester 1 or Semester 2

Module content

This module introduces tourism management from a systems perspective, covering tourism demand and supply as well as the functional and physical links between demand and supply. The environment in which tourism operates is also presented. The sectors within the tourism industry are introduced and special attention is given to hospitality management where the operational and management functions of the "guest cycle" are covered. The policies, principles and procedures relating to the financial operations and management in hospitality establishments are also discussed in this module.

Responsible ecotourism management 714 (TBE 714)

Qualification	Postgraduate
Module credits	20.00
Programmes	BScHons Geography and Environmental Science BScHons Geoinformatics BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 other contact session per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Division of Tourism Management
Period of presentation	Semester 1

Module content

This module focuses on managing ecotourism (including the natural and cultural resource base) following eco-principles and guidelines in order to provide a framework for sustainable/responsible tourism development in response to community needs within the Southern African context. The concepts of ecotourism, alternative tourism, responsible tourism and geotourism are debated.The management of ecotourism is studied from a theoretical perspective addressing issues such as the planning, design and sustainable development of eco-facilities and spaces; co-creation and the experienced tourist; the greening of the environment; and managing sustainable events; against the backdrop of climate change using local, national and international case studies. The aim is to provide students with a holistic perspective of ecotourism and to hone their entrepreneurial view to issues within this arena in order to apply sustainable eco-principles to various situations, ranging from green architectural structures and spaces to sustainable community and pro-poor tourism projects.

Dissertation: Horticultural science 890 (TBK 890)

Qualification	Postgraduate
Module credits	180.00

Programmes	MScAgric Horticulture MScAgric Horticulture
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presentation of the research results. In addition to the dissertation, the student is also expected to compile a concept research paper for publication in a peer-reviewed UP accredited scientific journal.

Thesis: Horticultural science 990 (TBK 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Horticultural Science PhD Horticultural Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presenting of the research results. In addition to the thesis, the student is also expected to publish at least one research paper in a peer-reviewed, UP accredited scientific journal. An oral examination covering Pasture Science and other fields related to the thesis will be conducted after the thesis has been accepted by examiners. A candidate needs to pass both the written thesis and oral examination to qualify for the degree.

Textiles: Utilities, fibres and yarns 212 (TKS 212)

Qualification	Undergraduate
Module credits	14.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class

Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Utility aspects: basic components of textiles, consumer decision making, utility aspects that include durability, comfort, maintenance, health/safety/protection and aesthetic aspects. Fibres and yarns: Fibre structure and performance including textile chemistry, fibre morphology and formation, fibre properties, classification and identification. Yarn structure and performance (including spun yarns, filament yarns, compound and novelty yarns).

Textiles: Structures and finishes 222 (TKS 222)

Qualification	Undergraduate
Module credits	10.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	TKS 212 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Fabric structures: Introduction to fabric structures. Woven fabrics, knits, non-woven fabrics and compound fabrics. Finishes and dyeing processes: Introduction to fabric finishing. Preparatory and final finishes. Finishes for special end-uses: durability, comfort and protection; ease of maintenance; aesthetic appeal. Dyed and printed fabrics.

New developments, sustainability and textiles in use 411 (TKS 411)

Qualification	Undergraduate
Module credits	13.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	TKS 212 and TKS 222 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

New developments (apparel textiles). Textile product use and basic physical quality testing procedures. Impact of textiles on the environment and sustainability.

Textiles: marketing and consumer aspects 421 (TKS 421)

Qualification	Undergraduate
Module credits	15.00
Programmes	BConSci Clothing Retail Management BConSci Clothing Retail Management
Prerequisites	TKS 411
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Clothing textiles and textile products from a marketing and consumer perspective. Practical project: Project to assess performance properties of textiles for specific end-use by using laboratory tests. A written report of the results is also required.

Animal breeding 320 (TLR 320)

Qualification	Undergraduate
Module credits	12.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	GTS 261
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Karyotyping of farm animals; breed and specie differences and the influence on classification of breeds. Influence of chromosomal aberrations. Phenotypic expression of genes and gene-interaction in farm animals. Single gene, major genes and polygenes. Variation in traits of economic importance and statistical description. Use of genetic variation. Estimation of breeding values and family indices on traits determined by single genes. Principles of breeding systems.

Animal breeding 411 (TLR 411)

Qualification	Undergraduate
Module credits	12.00
Programmes	BScAgric Animal Science BScAgric Animal Science

Prerequisites	TLR 320 and simultaneously register for GVK 420, PVK420, KVK420
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Components of animal performance. Sources of variation, population parameters and the estimation thereof. Introduction to matrix algebra for application in animal breeding. Selection indices theory. Statistical models in estimation of breeding values. Application of breeding values and prerequisites for accuracy. Breeding and selection for reproduction and growth. Principles of QTLs.

Applied animal breeding 420 (TLR 420)

Qualification	Undergraduate
Module credits	12.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	TLR 411
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Formulation and application of breeding objectives. Animal recording systems and international guidelines for evaluation. Specie-specific breeding systmes. Breeding objectives and selection programmes for beef and dairy cattle, small stock, poultry, pigs and companion animals. Selection of tTraits of economic importance and the efficiency thereof. Crossbreeding systems in meat producing farm animals. Breed development.

Animal breeding and genetics 700 (TLR 700)

Qualification	Postgraduate
Module credits	24.00
Prerequisites	No prerequisites.
Contact time	1 practical per week, 1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Qualitative characteristics. Calculation of population criteria and the interpretation in the industry. Specific problems with relation to the selection and breeding of cattle, small stock, pigs and poultry. The application of genetic theory in practice with relation to hereditability of quantitative characteristics. (Theoretical components include TLR 410 and TLR 420)

Animal breeding and genetics 801 (TLR 801)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 seminar per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Specialised studies in quantitative and molecular animal breeding in various livestock species. Advanced statistical modelling and EBV estimation. Application of genetic theory in practice with relation to heritability of quantitative characteristics. Advanced theory on the role of molecular technology in genetic improvement of farm animals. Experimental designs for QTL and MAS research and biodiversity studies as well as principles of genomic EBVs and GWAS. The study entails seminars, a literature study and discussion of selected topics relating to the industry specialisation programme. Discussion of research methods and results under local conditions. Policies regarding animal breeding.

Analysis of time series 880 (TRA 880)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WST 321 or TRA 720
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Difference equations. Lag operators. Stationary ARMA processes. Maximum likelihood estimation. Spectral analysis. Vector processes. Non-stationary time series. Long-memory processes.

Data science: analytics and visualisation 880 (TRG 880)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Prerequisites	Admission to relevant programme.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Supervised learning and applications. Multicollinearity, ridge regression, the LASSO and the elastic net. Parametric and nonparametric logistic regression and nonlinear regression. Survival regression. Regression extensions: Random forests MARS and Conjoint analysis. Neural networks.

Site surveying 213 (TRN 213)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Construction Management
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

General surveying; instruments, their handling and adjusting; surveying systems and simple calculations; determining of levels; setting out of the works; tacheometry and plotting; scales, planimetry; areas and volumes; construction surveying; aerial photography.

Dissertation: Applied mathematics 890 (TWS 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Applied Mathematics MSc Applied Mathematics
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Thesis: Applied Mathematics 990 (TWS 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Mathematical Sciences PhD Mathematical Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Academic orientation 102 (UPO 102)

Qualification	Undergraduate
Module credits	0.00

Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Culinary Science BSc Ecology BSc Engineering and Environmental Geology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Geology BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Mathematical Statistics BSc Mathematics BSc Medical Sciences BSc Meteorology BSc Microbiology BSc Physics BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences Deans Office
Period of presentation	Year

Academic orientation 120 (UPO 120)

Qualification	Undergraduate
Module credits	0.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Language of tuition	Module is presented in English

Department	Humanities Deans Office
Period of presentation	Year

Consumer facilitation 222 (VBF 222)

Qualification	Undergraduate
Module credits	8.00
Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Contact time	1 lecture per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Consumer decision making and consumer socialisation ; determinants of informed, responsible consumer decisions and consume satisfaction. Consumer education; development of consumer skills. Expenditure ptterns of the diverse South African consumer market and diverse market contexts. Consumerism. Globalisation.

Research project 400 (VBR 400)

Qualification	Undergraduate
Module credits	30.00
Programmes	BConSci Hospitality Management BConSci Clothing Retail Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	BEM 314 and Final-year status
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

Research methodology. Planning, executing and reporting a research project in clothing retail management; food retail management, hospitality management or culinary science.

Dissertation: Consumer science 890 (VBR 890)

Qualification	Postgraduate

Module credits	180.00
Programmes	MConSci MConSci MConSci Clothing Management MConSci Food Management MConSci Interior Merchandise Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Thesis: Consumer Science 990 (VBR 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Consumer Science Food Management PhD Consumer Science Clothing Management PhD Consumer Science Development PhD Consumer Science Food Management PhD Consumer Science Interior Merchandise Management
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Food service management 321 (VDB 321)

Qualification	Undergraduate
Module credits	18.00
Programmes	BConSci Hospitality Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Health Sciences
Prerequisites	Natural and Agricultural Sciences students: VDS 322 #
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Planning and layout of food service units for different food service systems. Equipment for food services. Factors influencing the choice and purchasing of equipment for different food service units. Hygiene and safety in food services. management in food service systems. Financial management in food services.

Food service management 420 (VDB 420)

Qualification	Undergraduate
Module credits	21.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	VDB 321 GS and ABV 320
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

The professional food service manager’s roles, responsibilities and characteristics. Contemporary leadership and management styles in food service systems. Professionalism and ethics. Advanced food service systems and production management techniques and training facilitation. Marketing of food services.

Nutrition 250 (VDG 250)

Qualification	Undergraduate
Module credits	12.00
Prerequisites	Natural and Agricultural Sciences students: CMY 127; Health Sciences students: second year status
Contact time	fortnightly practicals, 3 lectures per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Nutrition in the context of growth, development and composition of organisms. Metabolic processes and control in the body. Overview of nutritional processes. The study of the fundamental principles of nutrient metabolism (including macro- and micro-nutrients and water) and digestion physiology. Applications are made regarding man and animals.
Practical work: Experimental work and problem orientated tasks.

Nutrition 260 (VDG 260)

Qualification	Undergraduate
Module credits	12.00
Prerequisites	CMY127
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Nutrition in the context of growth, development and composition of organisms. Metabolic processes and control in the body. Overview of nutritional processes. The study of the fundamental principles of nutrient metabolism (including macro- and micro-nutrients and water) and digestion physiology. Applications are made regarding man and animals.
Practical work: Experimental work and problem orientated tasks.

Nutrition 311 (VDG 311)

Qualification	Undergraduate
Module credits	17.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science BSc Food Science
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

The study of nutrients and water regarding their chemical composition, characteristics, basic digestion, absorption, metabolism, functions, food sources and symptoms of deficiency and toxicity. Energy metabolism. Dietary recommendations and guidelines, dietary guides and meal planning. The use and application of food composition tables in dietary analysis.

Nutrition during life cycle 321 (VDG 321)

Qualification	Undergraduate
Module credits	17.00

Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	[FSG 110 and FSG 120] and VDG 311
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

The role of nutrition in the life cycle. The role of nutrition in the prevention of lifestyle related diseases - osteoporosis, cancer, coronary heart disease, tooth decay. Vegetarianism. Different conditions of malnutrition: Protein Energy Malnutrition and obesity.

Dissertation: Nutrition 890 (VDG 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Nutrition MSc Nutrition
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences
Period of presentation	Year

Thesis: Nutrition 990 (VDG 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Nutrition PhD Nutrition
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences
Period of presentation	Year

Basic food preparation 111 (VDS 111)

Qualification	Undergraduate
Module credits	6.00

Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Health Sciences
Prerequisites	No prerequisites.
Contact time	0.5 practical per week, 1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Module 1: Basic food preparation and food preparation techniques. Mise en place, weighing and measurement techniques, equipment and terminology as applied in food preparation. History of the foodservice industry and contemporary chefs. Basic food quality control.
Module 2: Food preparation basics of the following: stocks, soups and sauces

Basic food preparation 121 (VDS 121)

Qualification	Undergraduate
Module credits	6.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science BSc Extended programme - Biological and Agricultural Sciences
Service modules	Faculty of Health Sciences
Prerequisites	VDS 111
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Module 1: Principles and practices of food preparation and cooking techniques. Mise en place, weighing and measurement techniques, equipment and terminology as applied in food preparation. Basic food quality control.
Module 2: Food preparation basics of the following: starches and cereals

Food commodities and preparation 210 (VDS 210)

Qualification	Undergraduate
Module credits	18.00

Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Health Sciences
Prerequisites	VDS 121
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Module 1: The study of different food systems with regard to food preparation. Physical and chemical properties and the influence of the composition in food preparation.
Module 2: Food preparation basics of the following: soups and sauces, fruit and vegetables; salads; frozen desserts; gelatine.
Module 3: Origin and development of food habits; Factors influencing habits and choice; Dynamics of food habits. Influence of religion on food habits. Food habits of different ethnic groups.

Food commodities and preparation 221 (VDS 221)

Qualification	Undergraduate
Module credits	18.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Health Sciences
Prerequisites	VDS 210
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Module 1: The study of different food systems with regard to food preparation. Physical and chemical properties and the influence of the composition in food preparation.
Module 2: Food preparation basics of the following: meat; poultry; fish, legumes, eggs and milk, baked products (whole spectrum); leavening agents.
Module 3: The influence of culture on cuisines. Study of the cuisines of selected African, European and Eastern countries.

Consumer food research 310 (VDS 310)

Qualification	Undergraduate
Module credits	21.00
Programmes	BConSci Food Retail Management BConSci Food Retail Management BSc Culinary Science
Prerequisites	VDS 221
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Planning executing and reporting consumer food research. Food preservation and evaluation techniques. Experiments in food, emphasizing ingredient function and standard preparation methods. Application of experimental methods through which the chemical and physical reactions of food to different food handling, preparation and preservation techniques are illustrated. Quality evaluation and consumer orientated sensory evaluation of food products.

Large-scale food production and restaurant management 322 (VDS 322)

Qualification	Undergraduate
Module credits	31.00
Programmes	BConSci Hospitality Management BConSci Hospitality Management BSc Culinary Science
Service modules	Faculty of Health Sciences
Prerequisites	VDS 210 and VDS 221
Contact time	3 lectures per week, 3 practicals per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Module 1: Restaurant management. Table setting, table serving, wine service, food and wine pairing, beverage management
Module 2: Menu planning for different food service systems and styles of food service.
Module 3: Large scale food procurement, consumption and storage.
Practical work: Principles of large-scale food preparation and the practical application thereof in a practical restaurant situation. Recipe formats and adjustment applicable to large-scale food preparation. Work scheduling and the practical exposure to the use of large scale catering equipment in a real life situation.

Food safety and hygiene 354 (VDS 354)

Qualification	Undergraduate
Module credits	12.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Module 1: General anatomy and morphology of bacteria, viruses and fungi. Basic nutritional requirements of micro-organisms and the effect of environmental factors on microbiological growth. Food decay, food poisoning and preservation of food by micro-organisms. Basic principles involved in disinfections, sterilization and control of microbes; techniques of microbial repression: sterilization by using heat, radiation, filtration, chemicals decimation of numbers.
Module 2: Food safety approached from retail, commercial and institutional angles. Safety issues surrounding food. Principles of food safety and food hygiene; good manufacturing practices; HACCP and risk analysis; employee health, hygiene and safety; Consumer rights and protection; occupational health and safety; health and food safety legislation in South Africa.

Recipe development and standardisation 413 (VDS 413)

Qualification	Undergraduate
Module credits	30.00
Programmes	BConSci Hospitality Management BConSci Food Retail Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	VDS 310 or VDS 322
Contact time	3 lectures per week, 2 practicals per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Recipe development process. Development of appropriate recipes and food products for a given situation. Standardisation of recipes. Food styling and food photography.

Culinary art 414 (VDS 414)

Qualification	Undergraduate
Module credits	22.00
Programmes	BConSci Hospitality Management BConSci Hospitality Management BSc Culinary Science
Prerequisites	VDS 322
Contact time	2 lectures per week, 2 practicals per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Advanced food preparation and presentation techniques. Event planning and banqueting for Hospitality Management students and a culinary science project application for Culinary Science students

Consumer aspects of food 417 (VDS 417)

Qualification	Undergraduate
Module credits	15.00
Programmes	BConSci Food Retail Management BConSci Food Retail Management
Prerequisites	BEM 212
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 1

Module content

Module 1: Role playing factors relating to consumer behaviour, food procurement and consumption. The introduction of the 2011 Consumer protection act and food labelling laws. Consumer education in relation to consumers' social responsibility.
Module 2: A South African perspective on food retail management with a focus on how general logistics throughout the supply chain is implemented with the South African consumer in mind.

Culinary art 424 (VDS 424)

Qualification	Undergraduate
Module credits	22.00
Programmes	BConSci Hospitality Management BConSci Hospitality Management BSc Culinary Science

Prerequisites	VDS 414
Contact time	2 practicals per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Advanced food preparation and presentation techniques. Event planning and banqueting for Hospitality Management students and a culinary science project application for Culinary Science students.

Food retailing and visual merchandising of food 427 (VDS 427)

Qualification	Undergraduate
Module credits	17.00
Programmes	BConSci Food Retail Management BConSci Food Retail Management
Prerequisites	VDS 417
Contact time	1 practical per week, 1 lecture per week
Language of tuition	Afrikaans and English are used in one class
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Aspects of food retailing with regard to display, presentation and shop layout as applied to food products. Practical application of the principles in visual merchandising of food and food retailing in the food industry.

Food consumerism and product advice 723 (VDS 723)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Consumer Science
Period of presentation	Semester 1 or Semester 2

Module content

Factors influencing food consumption, consumer behaviour and food choice. Food product advice. Consumer advice, marketing of food products, consumer education.

Veterinary ethology 202 (VET 202)

Qualification	Undergraduate
Module credits	18.00
Programmes	BVSc
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	20 practicals, 81 lectures over a two week period
Language of tuition	Module is presented in English
Department	Production Animal Studies
Period of presentation	Year

Module content

The husbandry of and common procedures performed on key domestic species, behavioral principles of key domestic species, handling skills for key domestic animals, aspects of animal welfare.

Animal production systems 213 (VET 213)

Qualification	Undergraduate
Module credits	8.00
Programmes	BVSc
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 blocks with a total of 84 lectures, 4 weeks farm exposure
Language of tuition	Module is presented in English
Department	Production Animal Studies
Period of presentation	Semester 1

Module content

ntroduction to the concepts of animal production systems in South African production environments. Principles and requirements for extensive, semi-intensive and intensive livestock production with reference to large and small stock, poultry and pigs. Principles of communal farming systems in Southern Africa. Game management systems with reference to conservation and game farming. The role of the human in livestock production systems and sustainable production.

Nutrition science 310 (VGE 310)

Qualification	Undergraduate
Module credits	14.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	BCM 261 and BCM 262 and DAF 200 and VKU 250 and VKU 260

Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

Basic principles of chemistry, biochemistry of feed constituents, digestion and metabolism in all livestock species. Description of the characteristics of commonly used feedstuffs, such as forages, silage and hay protein and energy concentrates and by-products.

Nutrition Science 320 (VGE 320)

Qualification	Undergraduate
Module credits	14.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	VGE 320
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Evaluation of energy and nutrient content of feedstuffs and assessment of nutritional requirements, and feeding standards for maintenance, growth, reproduction and lactation.

Monogastric nutrition and production 411 (VGE 411)

Qualification	Undergraduate
Module credits	16.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	VGE 320
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Specialised nutrition of monogastric animals: poultry, pigs, horses and selected freshwater aquatic organisms. Pig production and management - sow, boar and growing pigs. Feeding and housing systems. Hygiene and herd health programmes, product quality and marketing. Practical work: The use of computer systems in managing the feeding of selected monogastric animals.

Animal nutrition 703 (VGE 703)

Qualification	Postgraduate
Module credits	50.00
Prerequisites	No prerequisites.
Contact time	1 practical per week, 5 lectures per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Advanced study with specialisation in the neutrino of monogastric species for example poultry, dogs and pigs. Advanced study of foregut and hindgut digestive processes and flow dynamics. Manipulation of digestion, end product metabolism, ad libitum and controlled feed intake. Energy, protein, mineral and vitamin requirements and standards for beef and diary cattle, small stock and horses. Appropriate ration formulation. The study embodies lectures, seminars, practical assignments and a research project with the results reported in a research paper. (Theoretical components include VGE 411, VGE 421 and VGE 423.)

Monogastric nutrition 801 (VGE 801)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Advanced study with specialisation in the nutrition of monogastric species for example poultry, dogs, pigs, aquaculture species, pets, cage birds, game birds and waterfowl as well as monogastric species in zoos and game breeding ranches. The study entails research, seminars and practical assignments.

Ruminant nutrition 802 (VGE 802)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Advanced study of foregut and hindgut digestive processes and flow dynamics. Manipulation of digestion, end product metabolism, ad libitum and controlled feed intake. Energy, protein, mineral and vitamin requirements and standards for beef and dairy cattle, small stock and horses. Appropriate ration formulation. The study entails lectures, seminars, practical assignments and a research project with the results reported in a research paper.

Pig science 800 (VKD 800)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Specialised study concerning pig production, considerations when planning pig production units, policy planning and market conditions. Production physiology, housing, nutritional management, breeding practices, diseases and hygiene. Products. Practical scientific and industry orientation through different assignments.

Animal science pharmacology 411 (VKF 411)

Qualification	Undergraduate
Module credits	8.00
Prerequisites	DFS 320 and VGE 320
Contact time	3 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

The pharmacology, laws, control and use of substances for animal production.

Animal science, breeding and nutrition 223 (VKU 223)

Qualification	Undergraduate
Module credits	14.00
Programmes	BVSc

Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	3 blocks with a total of 120 lectures
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Introduction to adaptation physiology with reference to origin and domestication of farm and companion animals. Livestock species, breed development and diversity. Principles of applied animal breeding, quantitative and qualitative inheritance. Trait classification and factors influencing genetic progress in farm animals. Introduction to animal nutrition with the focus on feed intake, digestibility and metabolism of feeds in both monogastric and ruminant animals. Classification of feedstuffs and the nutritive value in the diet for the different farm animal species. An introduction to applied nutrition and feeding of monogastric and ruminant animals, equine and companion animals.

Animal science 250 (VKU 250)

Qualification	Undergraduate
Module credits	8.00
Programmes	BScAgric Animal Science BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 1

Module content

A brief perspective on the South African livestock industry. South African biomes in which animal production is practised. Animal ecological factors that influence regional classification. Introduction to adaptation physiology with reference to origin and domestication of farm and companion animals. Livestock species, breed development and breed characterisation. Basic principles of animal breeding and genetics, animal nutrition. Practical work includes identification and classification of different breeds of livestock.

Animal Science 260 (VKU 260)

Qualification	Undergraduate
Module credits	8.00
Programmes	BScAgric Animal Science BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science
Prerequisites	VKU 250 GS or permission from the HOD.

Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Introduction to the concepts of animal production systems in South African production environments. Principles and requirements for extensive, semi-intensive and intensive livestock production with reference to large- and small stock, poultry and pigs. Principles of communal farming systems in Southern Africa. Game management systems with reference to conservation and game farming. The role of the human in livestock production systems and sustainable production.

Research methodology 400 (VKU 400)

Qualification	Undergraduate
Module credits	16.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	Simultaneously register GVK 420, TLR 411
Contact time	2 lectures per week, 1 seminar per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Introduction to research methodology. Principles and terminology related to research in animal science. Scientific writing skills and communication. Popular articles, seminars and preparation of scientific manuscripts. Project proposals: approach to problem solving, methodology and appropriate referencing and reporting. Presentation of seminar. Multidisciplinary case studies in a Southern African context.

Animal science 700 (VKU 700)

Qualification	Postgraduate
Module credits	70.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

The study of animal-environment and genotype-environment interactions and the impact on natural resources. Adaptational mechanisms of breeds and species. The formulation of optimal farming systems with respect to adaption. The determination of biological outputs and the classification of animal breeds and species in terms of biological traits. A study of specific topics by way of literature, seminars, discussions and research assignments. Each student does a research project and compiles a research paper. Research and study assignments are executed taking the academic needs of the candidates into consideration. (Theoretical components GVK 420, KVK 420, PVK 420, VKD 410, VKU 411, VKU 412 and WKE 420.)

Dissertation: Animal science 801 (VKU 801)

Qualification	Postgraduate
Module credits	180.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Dissertation: Animal science 890 (VKU 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Animal Science Animal Breeding and Genetics MScAgric Animal Science Animal Breeding and Genetics MScAgric Animal Science Animal Nutrition MScAgric Animal Science Livestock Production and Ecology MScAgric Animal Science Production Physiology and Product Quality
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Dissertation of 180 credits.

Thesis: Animal science 990 (VKU 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Animal Science PhD Animal Science
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Meat science 801 (VLE 801)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Advanced study of carcass and meat quality characteristics as influenced by breeding, nutrition, physiology, growth and development as well as treatment and processing technology. Cattle, sheep, goats, pigs, poultry and game. Processing. Saleability, marketing methods, consumer profiles. Organisation and legislation.

Distribution-free methods 710 (VMT 710)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematical Statistics BScHons Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WST 311, WST 312, WST 321
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

A selection of: Nonparametric stochastic processes. Power and asymptotic power of distribution-free procedures. Theory and simulation. Asymptotic relative efficiency. Linear rank tests: Definition, properties and applications. Equal in distribution technique. Counting and ranking statistics. Introduction to one and two sample U-statistics. Permutation and distribution-free rank-like statistics. Multi-sample distribution-free tests, rank correlation and regression. Some nonparametric bootstrap and smoothing methods.

Livestock ecology 800 (VNE 800)

Qualification	Postgraduate
Module credits	15.00

Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

The study of animal-environment and genotype-environment interactions and the impact on natural resources. Adaptational mechanisms of breeds and species. The formulation of optimal farming systems with respect to adaptation. The determination of biological outputs and the classification of animal breeds and species in terms of biological traits. Research and study assignments are executed taking the academic needs of the candidates into consideration.

Meat and dairy science 420 (VSX 420)

Qualification	Undergraduate
Module credits	8.00
Programmes	BScAgric Animal Science BScAgric Animal Science
Prerequisites	DFS 320
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Meat industry. Meat species. Composition of carcass and meat, slaughtering process, meat quality, and the consumer. Dairy industry. Composition and nutritional value of milk and factors that influence it. Milk production, milk quality and distribution.

Food composition and applied nutritional programmes 364 (VVW 364)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Food Science BSc Food Science BSc Nutrition
Prerequisites	FST 351 and FST 352 or permission from the HOD.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences

Period of presentation	Semester 2

Module content

Generation, interpretation and application of food composition data in nutrition programmes. Chemical composition of foods: sampling for food analysis, assessing methods of food analysis for inclusion in food composition data. Interpretation of food composition data. Nutritional labeling of food. Use of nutritional data in food formulations. Dietary supplementation, enrichment and fortification of foods.

Advanced nutrition and food sciences 720 (VVW 720)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	12 discussion classes
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Discussion classes in advanced level nutrition and food sciences. Problem solving and literature discussion.

Research project 763 (VVW 763)

Qualification	Postgraduate
Module credits	40.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 3 practicals per week
Language of tuition	Module is presented in English
Department	Consumer and Food Sciences
Period of presentation	Year

Module content

A short research project on an approved topic in Nutrition and Food Sciences is planned, executed and presented in the form of a written report.

Micronutrient malnutrition 765 (VVW 765)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English

Department	Consumer and Food Sciences
Period of presentation	Semester 2

Module content

Introduction to malnutrition in sub-Saharan Africa. Selected micronutrients (i.e. vitamin A, Fe, iodine, Zn): Their role as micronutrients and their significance in health, deficiency disorders and prevention thereof. Conceptual framework for understanding micronutrient deficiencies. Nutritional epidemiology. Micronutrients in nutritional support of individuals with HIV/aids.

Pasture science 213 (WDE 213)

Qualification	Undergraduate
Module credits	12.00
Programmes	BVSc
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Contact time	2 blocks with a total of 60 lectures
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Basic principles of pasture science: the influence of biotic and abiotic factors on the productivity of different strata and components of natural and planted pastures. This will enable the student to understand the management, production, appropriate and optimal utilisation as well as the conservation of these pastures. These principles can be used to ensure sustainable animal production and health.

One large assignment to be completed during recess in addition to lecture time.

Principles of veld management 310 (WDE 310)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Meteorology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences
Prerequisites	No prerequisites.
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Afrikaans and English are used in one class
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The influence of biotic and abiotic factors on the productivity of different strata and components of natural pastures. This will enable the student to advise users, with the necessary motivation, on the appropriate use of these strata and components and will form a basis for further research on this system. The principles of veld management s and the influence of management practices on sustainable animal production from natural pastures. This will enable the student to advise users on veld management and veld management principles. It will also form a basis for further research on veld management.

Planted pastures and fodder crops 320 (WDE 320)

Qualification	Undergraduate
Module credits	12.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences
Prerequisites	WDE 310
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Afrikaans and English are used in one class
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

Module content

The establishment and use of planted pastures species and fodder crops and the conservation of fodder. This will enable students to advise users on establishment and utilization of planted pastures species as well as farmers on the production, conservation and optimum use of fodder. This will also form a basis for further research on planted pastures.

Advanced pasture science 450 (WDE 450)

Qualification	Undergraduate
Module credits	15.00
Programmes	BScAgric Applied Plant and Soil Sciences BScAgric Animal Science BScAgric Applied Plant and Soil Sciences
Prerequisites	WDE 320
Contact time	2 lectures per week, 3 practicals per week
Language of tuition	Separate classes for Afrikaans and English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

The production potential and quality of pastures as influenced by botanical composition, vegetation cover, livestock grazing and browsing potential, soil chemical, physical and biological conditions in addition to other important environmental processes are addressed. Pasture selection for different purposes and the importance of pasture management requirements within a planned livestock fodder flow system are taught. Monitoring pastures (both natural and cultivated) in different biomes of Southern Africa, through different assessment techniques to understand the health, production potential and quality thereof is explained. The different utilisation methods of pastures, as influenced by the livestock factor and their effects on the pastures regrowth potential, in addition to soil quality aspects are important principles that determine the value of pastures. The evaluation of grasses and other vegetation types in terms of adaptation, acceptability and adaptability to environmental and management conditions are important to an integrated and adaptive pasture and livestock production system.

Range management in wildlife systems 701 (WDE 701)

Qualification	Postgraduate
Module credits	10.00
Programmes	BScHons Wildlife Management BScHons Wildlife Management
Prerequisites	No prerequisites.
Contact time	5 discussion classes per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Range evaluation and utilisation with the emphasis on aspects important in wildlife production, and integrated wildlife/livestock production systems.

Environmental resource assessment and management 750 (WDE 750)

Qualification	Postgraduate
Module credits	14.00
Prerequisites	No prerequisites.
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Determining resource potential of land on the basis of botanical composition, vegetation cover, animal grazing and browsing potential, water quality, soil quality, chemical, physical and biological soil degradation, soil erosion and other important environmental processes. These are essential for integrated agricultural land use practices. Evaluation of grasses and other vegetation types in terms of environmental adaptation, acceptability and adaptability to a sustainable utilisation system and the management requirements of an integrated and adaptive management system.

Rangeland management 781 (WDE 781)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

The development of rangeland management strategies integrating ecological and physiological principles with economic and sociological constraints to achieve desired objectives whilst ensuring the conservation, and where necessary, the recuperation of natural resources.

Pasture science 782 (WDE 782)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScAgricHons Crop Science BScAgricHons Crop Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

The identification of adapted pasture and fodder species (including grasses, legumes, fodder trees and drought tolerant crops) for different agro-ecological areas. The establishment, fertilization and irrigation requirements of different pastures. The management requirements when utilized as green grazing, standing hay or conserved feed.

Integrated plant and animal production 783 (WDE 783)

Qualification	Postgraduate
Module credits	14.00
Prerequisites	No prerequisites.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

The role of crop rotations and ley crops in marginal cropping conditions to ensure sustained production. The integration of pastures and silvicultural/ horticultural crops (eg. Agro-forestry) to produce timber, firewood, fruits/nuts and livestock products. Provision of feed requirements for both commercial and communal livestock enterprizes by combining livestock requirements and feed supply in a process of economic optimization and emphasizing the importance of records and responses in the process of implementation.

Advanced coursework 801 (WDE 801)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Contact time	1 practical per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Any module and/or assignment(s) at the advanced level chosen in consultation with the head of department.

Dissertation: Pasture science 890 (WDE 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MScAgric Pasture Science MScAgric Pasture Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presentation of the research results. In addition to the dissertation, the student is also expected to compile a concept research paper for publication in a peer-reviewed UP accredited scientific journal.

Mini-dissertation: Pasture science 891 (WDE 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

Each candidate must write a mini-dissertation on his/her research project in Pasture Science and at least prepare a concept research paper for publication in a peer-reviewed scientific journal.

Thesis: Pasture science 990 (WDE 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Pasture Science PhD Pasture Science
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Year

Module content

This module involves the development, presentation and approval of a research proposal, the execution of the research project, and the writing up and presenting of the research results. In addition to the thesis, the student is also expected to publish at least one research paper in a peer-reviewed, UP accredited scientific journal. An oral examination covering Pasture Science and other fields related to the thesis will be conducted after the thesis has been accepted by examiners. A candidate needs to pass both the written thesis and oral examination to qualify for the degree.

Dissertation Mathematics 890 (WIS 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Mathematics MSc Mathematics

Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Thesis: Mathematics 990 (WIS 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Mathematical Sciences PhD Mathematical Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Atmospheric structure and processes 155 (WKD 155)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Geography BSc Chemistry BSc Geography BSc Meteorology BSc Physics
Prerequisites	At least 50% for mathematics in grade 12.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

*Students are not allowed to earn credits for WKD 155 and WKD 164

Introduction to weather and climate. Climate of South Africa. Urban and rural climate. Meteorological instruments. Motion of the earth. Atmospheric mass and pressure. Energy and heat budget. Moisture in the atmosphere. Cloud development. Climate change. ENSO. Electromagnetic spectrum and remote sensing in meteorology. Synoptic weather systems of South Africa.

Climate and weather of Southern Africa 164 (WKD 164)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Chemistry BSc Chemistry BSc Environmental Sciences BSc Extended programme - Physical Sciences BSc Geography BSc Geoinformatics
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 4

Module content

An introduction to the climate and general seasonal climatic circulation patterns of Southern Africa. Basic weather types and weather processes within the Southern African context. Interpretation of synoptic maps and synoptic station reports. Impacts of climate change and extreme climate events on society.
*BSc (Geography) and BSc (Environmental Sciences) students may register for WKD 155. Students are not allowed to earn credits for both WKD 155 and WKD 164.

Programming in meteorology 254 (WKD 254)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Physics BSc Meteorology BSc Physics
Prerequisites	WKD 261 and WKD 263. Limited to BSc (Meteorology) students or permission from the HOD.
Contact time	1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Meteorological data acquisition. Manipulation of multidimensional meteorological data sets. Spatial representation and interpretation of weather data. Introduction to statistical and numerical methods. Introduction to atmospheric cloud models.

Physical meteorology 261 (WKD 261)

Qualification	Undergraduate

Module credits	12.00
Programmes	BSc Geography BSc Environmental Sciences BSc Geography BSc Meteorology BSc Physics
Prerequisites	WTW 114
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 1

Module content

Conservative forces and conservation laws. Basic thermodynamic laws for dry and humid air. The equation of state. Adiabatic processes and temperature lapse rates. The Clausuis-Claperon equation. Calculation of the wet adiabat. Radiative transfer. The physical basis of climate change.

Introduction to dynamic meteorology 263 (WKD 263)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Geography BSc Geography BSc Meteorology BSc Physics
Prerequisites	WTW 126 and WTW 128 (students should simultaneously be enrolled for WTW 218).
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 2

Module content

Vector algebra, curl of a vector, total and partial derivatives, second law of motion. Spherical coordinates Acceleration in rotating co-ordinates, fundamental forces, momentum equation. Three dimensional flow balance, conservation of mass, heat equation, thermodynamic energy equation. Introduction to finite difference methods. Numerical estimation of the geostrophic wind, vorticity and divergence. Advection of temperature. Development of a two-dimensional temperature advection model.

Atmospheric vorticity and divergence 352 (WKD 352)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Physics BSc Meteorology BSc Physics
Prerequisites	WKD 263 GS and WTW 248 GS
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 3

Module content

Scale analyses and simplification of the basic equations. The geostrophic, thermal and gradient wind. The vorticity equation and divergence. Potential vorticity. Vertical motion and surface pressure tendency. Vorticity in barotropic fluids. Vorticity and divergence fields in a present and future climate

Quasi-geostrophic analysis 361 (WKD 361)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Physics BSc Meteorology BSc Physics
Prerequisites	WKD 352 GS and WKD 254
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Quarter 4

Module content

Tendency and Omega equations. Model of a boroclinic system. Introduction to numerical models. Application in meteorological display and analysis software.Ascending and subsiding motion in a present and future climate.

Fundamentals of weather forecasting 366 (WKD 366)

Qualification	Undergraduate
Module credits	36.00
Programmes	BSc Physics BSc Meteorology BSc Physics
Prerequisites	WKD 155, WKD 261, WKD 254 (students should simultaneously be enrolled for WKD 361)
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English

Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

Integration of information to describe the current state of the atmosphere and to predict a future state of the atmosphere. Weather forecasting techniques. Applications of remote sensing in weather forecasting. Aerological diagrams and codes. Weather forecasting software and application to numerical weather prediction. Climate change and synoptic circulation.

Seasonal and climate modelling 703 (WKD 703)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Fundamentals of seasonal forecasting. The El Niño/Southern Oscillation. Empirical orthogonal functions. Canonical correlation analysis. Empirical forecast models practical. Sea-surface temperature models. Fully coupled and two-tiered general circulation modelling. Dynamical and empherical downscaling techniques. Significance testing using Monte Carlo techniques. Modelling pitfalls. User application forecasting. Projections of decadal and multi dacadal climate anomalies.

Numerical modelling: applications 704 (WKD 704)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Initial atmospheric state, observation network, data assimilation, initialization, parameterisation, post-processing. Ensemble methods, probability forecasting, forecast verification. Global circulation models, limited-area and mesoscale models, variable resolution models, dispersion models. Seamless prediction. Practical applications.

Dynamic meteorology 706 (WKD 706)

Qualification	Postgraduate
Module credits	16.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Atmospheric oscillations: Linear perturbation theory (shallow water gravity waves, inertia gravity waves, Rossby waves). Baroclinic instability. Two-layer model. Energetics of Baroclinic waves. Zonally averaged circulation. Angular momentum budget. Lorenz energy cycle. Programming in metereology.

Radar meteorology 707 (WKD 707)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Basic principles and characteristics of the weather radar. The influence of the atmosphere on the propogation of electro-magnetic waves. Weather radar equation. The influence of attenuation on observations. The measurement of precipation with a radar. Doppler Radar. Convective storm analysis with radar.

Boundary layer meteorology 719 (WKD 719)

Qualification	Postgraduate

Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Introduction to, and the importance of the boundary layer. Structure of the boundary layer. Transfer of heat (molecular and turbulent). Impacts of the turbulent nature of the boundary layer on the dynamics of atmospheric motions. Closure and boundary layer parameterisation. Applications to air pollution dispersion.

Overview of tropical and mid-latitude meteorology 731 (WKD 731)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

An overview of the weather and climate of the tropics and the mid-latitudes. Air masses. Instability and cloud formation. Weather systems of the tropics and mid-latitudes. Analysis of weather systems by utilising remote sensed data.

Satellite meteorology 733 (WKD 733)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Overview of the basic principles of satellite imagery. Types of meteorological satellites. Basic principles of radiation. The different images available, their resolution and the advantages and limitations of each image. Image interpretation.

Mesoscale meteorology 734 (WKD 734)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

An introduction to mesoscale meteorology. Surface mesoscale features, instability, severe storm classification and thunderstorms, flooding and flash flooding events.

Selected themes 736 (WKD 736)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

A module on an aspect or aspects of meteorology not covered in the existing options with special emphasis in Cloud microphysics and Basic concepts of numberical modelling.

Research project 763 (WKD 763)

Qualification	Postgraduate
Module credits	35.00
Programmes	BScHons Meteorology BScHons Meteorology

Prerequisites	No prerequisites.
Contact time	1 discussion class per week, 1 lecture per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Year

Module content

Introduction to the philosophy of scientific research. Hypothesis testing. Reporting of scientific research. Identification of an appropriate research project. Compilation of a research proposal. Literature survey. Acquisition and manipulation of information. Introduction to innovative strategy and research management. Preparation of a research report (or paper). Presentation of research findings.

Cloud dynamics 781 (WKD 781)

Qualification	Postgraduate
Module credits	12.00
Programmes	BScHons Meteorology BScHons Meteorology
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1 or Semester 2

Module content

Scaling and interpretation of equations of motion for mesoscale processes. The role of stability and other trigger actions on initial cloud formation and the evolution of clouds. Shallow and deep convective processes. Tropical and mid-latitude cloud generation processes and characteristics. Cloud splitting. Parameterisation of radiation and heat in atmospheric models. Microphysics parameterisations in numerical models.

Wildlife science 420 (WKE 420)

Qualification	Undergraduate
Module credits	8.00
Programmes	BScAgric Agricultural Economics and Agribusiness Management BScAgric Agricultural Economics and Agribusiness Management
Prerequisites	VGE 320
Contact time	2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Animal and Wildlife Sciences
Period of presentation	Semester 2

Module content

Introductory aspects of wildlife conservation, habitat management, wildlife nutrition and keeping wildlife in zoological gardens.

Wool science 800 (WLK 800)

Qualification	Postgraduate
Module credits	15.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 1 discussion class per week
Language of tuition	Module is presented in English
Department	Animal and Wildlife Sciences
Period of presentation	Year

Module content

Discussions and literature studies on advanced subjects concerning wool and fibre. Factors influencing wool and mohair production. The influence of environment, nutrition and breeding on the chemical and physical composition of wool and mohair. Factors influencing classing, processing and marketing of wool. Discussions and seminars on techniques in quantifying physical and chemical characteristics of wool and mohair, relevant literature and research techniques. Evaluation of variation in skin and fibre.

Mini-dissertation: Wildlife health, ecology and management 890 (WLS 890)

Qualification	Postgraduate
Module credits	90.00
Programmes	MSc Wildlife Health, Ecology and Management (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	VRM 813
Language of tuition	Module is presented in English
Department	Production Animal Studies
Period of presentation	Year

Mathematical statistics 111 (WST 111)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	At least 5 (60-69%) in Mathematics in the Grade 12 examination
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Characterisation of a set of measurements: Graphical and numerical methods. Random sampling. Probability theory. Discrete and continuous random variables. Probability distributions. Generating functions and moments.

Mathematical statistics 121 (WST 121)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 111 GS or WST 133, 143 and 153
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Sampling distributions and the central limit theorem. Statistical inference: Point and interval estimation. Hypothesis testing with applications in one and two-sample cases. Introductory methods for: Linear regression and correlation, analysis of variance, categorical data analysis and non-parametric statistics. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Mathematical statistics 133 (WST 133)

Qualification	Undergraduate

Module credits	8.00
Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	At least 4 (50-59%) in Mathematics in the Grade 12 examination; BSc and BCom numeric stream students must be take WTW 133 concurrently.
Contact time	4 lectures per week, Foundation Course, 1 practical per week, 2 tutorials per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Descriptive statistics – Univariate:
The role of Statistics, various types of data. Sampling, probability and non-probability sampling techniques and the collection of data. Frequency, relative and cumulative distributions and graphical representations. Additional concepts relating to data processing: sigma notation, factorial notation. Descriptive measures of location,dispersion and symmetry. Exploratory data analysis.
Probability:
Introductory probability theory and applications. Set theory and probability laws. Introduction to random variables. Assigning probabilities, probability distributions, expected value and variance in general. Specific discrete probability distributions (Uniform, Binomial). Report writing and presentation. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Mathematical statistics 143 (WST 143)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Physical Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BSc and BCom numeric students: WST 133 and WTW 133 and must be taken concurrently with WTW 143.
Contact time	4 lectures per week, 1 practical per week, 2 tutorials per week, Foundation Course
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Probability and inference:
Probability theory and theoretical distributions for continuous random variables (Uniform, Normal and t). Sampling distributions (means and proportions). Estimation theory and hypothesis testing of sampling averages and proportions (one- and two-sample cases).
Optimisation techniques with economic applications:
Applications of differentiation in statistic and economic related problems. Integration. Applications of integration in statistic and economic related problems. Systems of equations in equilibrium. The area under a curve and applications of definite integrals in Statistics and Economics. Report writing and presentation. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Mathematical statistics 153 (WST 153)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Extended programme - Mathematical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 133 and WST143 and WTW 143. Must be taken concurrently with WTW 153.
Contact time	2 tutorials per week, 1 practical per week, Foundation Course, 4 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Probability distributions:
Introductory distribution theory and special statistical distributions (Binomial, Geometric, Hypergeometric, Poisson, Uniform, Normal, Gamma). Generating functions and moments. Bivariate probability distributions. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

Mathematical statistics 211 (WST 211)

Qualification	Undergraduate
Module credits	24.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 111, WST 121, WTW 114 GS and WTW 124 GS
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Set theory. Probability measure functions. Random variables. Distribution functions. Probability mass functions. Density functions. Expected values. Moments. Moment generating functions. Special probability distributions: Bernoulli, binomial, hypergeometric, geometric, negative binomial, Poisson, Poisson process, discrete uniform, uniform, gamma,exponential, Weibull, Pareto, normal. Joint distributions: Multinomial, extended hypergeometric, joint continuous distributions. Marginal distributions. Independent random variables. Conditional distributions. Covariance, correlation. Conditional expected values. Transformation of random variables: Convolution formula. Order statistics. Stochastic convergence: Convergence in distribution. Central limit theorem. Practical applications. Practical statistical modelling and analysis using statistical computer packages and the interpretation of the output.

Applications in data science 212 (WST 212)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Mathematical Statistics
Prerequisites	WST 111, WST 121, WTW 114 (GS), WTW 124 (GS).
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Introduction to database design, extracting data from databases using different software packages. Introduction to machine learning. Commonly used machine learning techniques

Mathematical statistics 221 (WST 221)

Qualification	Undergraduate
Module credits	24.00

Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211 GS
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Stochastic convergence: Asymptotic normal distributions, convergence in probability. Statistics and sampling distributions: Chi-squared distribution. Distribution of the sample mean and sample variance for random samples from a normal population. T-distribution. F-distribution. Beta distribution. Point estimation: Method of moments. Maximum likelihood estimation. Unbiased estimators. Uniform minimum variance unbiased estimators. Cramer-Rao inequality. Efficiency. Consistency. Asymptotic relative efficiency.
Bayes estimators. Sufficient statistics. Completeness. The exponential class. Confidence intervals. Test of statistical hypotheses. Reliability and survival distributions. Practical applications. Practical statistical modelling and analysis using statistical computer packages and the interpretation of the output.

Multivariate analysis 311 (WST 311)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Multivariate statistical distributions: Moments of a distribution, moment generating functions, independence. Multivariate normal distribution: Conditional distributions, partial and multiple correlations. Distribution of quadratic forms in normal variables. Multivariate normal samples: Estimation of the mean vector and covariance matrix, estimation of correlation coefficients, distribution of the sample mean, sample covariance matrix. Principal component analysis.The linear model: Models of full rank, least squares estimators, test of hypotheses.The generalised linear model: Exponential family mean and variance, link functions, deviance and residual analysis, test statistics, log- linear and logit models. Practical applications: Practical statistical modelling and analysis using statistical computer packages and interpretation of the output.

Stochastic processes 312 (WST 312)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1

Module content

Definition of a stochastic process. Stationarity. Covariance stationary. Markov property. Random walk. Brownian motion. Markov chains. Chapman-Kolmogorov equations. Recurrent and transient states. First passage time. Occupation times. Markov jump processes. Poisson process. Birth and death processes. Structures of processes. Structure of the time-homogeneous Markov jump process. Applications in insurance. Practical statistical modelling, analysis and simulation using statistical computer packages and the interpretation of the output.

Time-series analysis 321 (WST 321)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematics BSc Meteorology BSc Physics

Service modules	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Note: Only one of the modules WST 321 or STK 320 may be included in any study programme.

Stationary and non-stationary univariate time-series. Properties of autoregressive moving average (ARMA) and autoregressive integrated moving average (ARIMA) processes. Identification, estimation and diagnostic testing of a time-series model. Forecasting. Multivariate time-series. Practical statistical modelling and analysis using statistical computer packages.

Actuarial statistics 322 (WST 322)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Economic and Management Sciences Faculty of Natural and Agricultural Sciences
Prerequisites	WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 2

Module content

Bayes estimation. Loss distributions. Reinsurance. Risk models. Ruin theory. Credibility theory. Extreme value theory. Copulas. Practical statistical modelling and analysis using statistical computer packages.

Research report: Mathematical statistics 795 (WST 795)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Mathematical Statistics
Prerequisites	WST 311, WST 312, WST 321

Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 and Semester 2

Module content

Refer to the document: Criteria for the research management process and the assessment of the honours essays, available on the web: www.up.ac.za under the Department of Statistics: postgraduate study.

Cyber analytics 802 (WST 802)

Qualification	Postgraduate
Module credits	20.00
Programmes	MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Economic and Management Sciences
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Semester 1 or Semester 2

Module content

Reviewing, from a statistical perspective, the cyber-infrastructure ecosystem including distributed computing, multi node and distributed file eco systems, such as Amazon Web Services. Structured and unstructured data sources, including social media data and image data. Setting up of large data structures for analysis. Algorithms and techniques for computing statistics and statistical models on distributed data. Software to be used include, Hadoop, Map reduce, SAS, SAS Data loader for Hadoop.

Mini-dissertation: Mathematical statistics 895 (WST 895)

Qualification	Postgraduate
Module credits	100.00
Programmes	MSc Advanced Data Analytics (Coursework) MSc Advanced Data Analytics (Coursework)
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Thesis: Mathematical statistics 990 (WST 990)

Qualification	Postgraduate
Module credits	360.00

Programmes	PhD Mathematical Statistics PhD Mathematical Statistics
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Statistics
Period of presentation	Year

Calculus 114 (WTW 114)

Qualification	Undergraduate
Module credits	16.00
Programmes	BCom Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities
Prerequisites	60% for Mathematics in Grade 12
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218 and WTW 220). Students will not be credited for more than one of the following modules for their degree: WTW 114, WTW 158, WTW 134, WTW 165.
Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, evaluating definite integrals using anti-derivatives, the substitution rule.

Discrete structures 115 (WTW 115)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Meteorology BSc Applied Mathematics BSc Chemistry BSc Extended programme - Mathematical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	50% for Mathematics in Grade 12
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Propositional logic: truth tables, logical equivalence, implication, arguments. Mathematical induction and well-ordering principle. Introduction to set theory. Counting techniques: elementary probability, multiplication and addition rules, permutations and combinations, binomial theorem, inclusion-exclusion rule.

Numerical analysis 123 (WTW 123)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 114 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Non-linear equations, numerical integration, initial value problems for differential equations, systems of linear equations. Algorithms for elementary numerical techniques are derived and implemented in computer programmes. Error estimates and convergence results are treated.

Mathematics 124 (WTW 124)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Extended programme - Mathematical Sciences BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Students will not be credited for more than one of the following modules for their degree:
WTW 124, WTW 146, WTW 148 and WTW 164. This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218, WTW 211 and WTW 220).

The vector space Rn, vector algebra with applications to lines and planes, matrix algebra, systems of linear equations, determinants. Complex numbers and factorisation of polynomials. Integration techniques and applications of integration. The formal definition of a limit. The fundamental theorem of Calculus and applications. Vector functions, polar curves and quadratic curves.

Precalculus 133 (WTW 133)

Qualification	Undergraduate
Module credits	8.00
Programmes	BEd Senior Phase and Further Education and Training Teaching BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences

Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	BSc Extended programme - Mathematical Sciences: 60% for Mathematics in Grade 12 Other BSc Extended programmes: 50% for Mathematics Grade 12 BCom Extended programme: 40% for Mathematics in Grade 12 BEd programmes: 50% for Mathematics Grade 12
Contact time	1 practical per week, Foundation Course, 3 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Real numbers, elementary set notation, exponents and radicals. Algebraic expressions, fractional expressions, linear and quadratic equations, inequalities. Coordinate geometry: lines, circles. Functions: definition, notation, piecewise defined functions, domain and range, graphs, transformations of functions, symmetry, even and odd functions, combining functions, one-to-one functions and inverses, polynomial functions and zeros. Sequences, summation notation, arithmetic, geometric sequences, infinite geometric series, annuities and instalments. Degrees and radians, unit circle, trigonometric functions, fundamental identities, trigonometric graphs, trigonometric identities, double-angle, half-angle formulae, trigonometric equations, applications.

This module is offered at the Mamelodi Campus to students from the BSc and BCom Extended programmes. At the Groenkloof Campus it is offered to BEd students.

Mathematics 134 (WTW 134)

Qualification	Undergraduate
Module credits	16.00

Programmes	BCom Statistics BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Culinary Science BSc Ecology BSc Entomology BSc Environmental Sciences BSc Food Science BSc Genetics BSc Geography BSc Geoinformatics BSc Human Genetics BSc Human Physiology BSc Human Physiology, Genetics and Psychology BSc Medical Sciences BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Veterinary Science
Prerequisites	50% for Mathematics in Grade 12
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

**Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 165, WTW 114, WTW 158. WTW 134 does not lead to admission to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 134 is offered as WTW 165 in the second semester only to students who have applied in the first semester of the current year for the approximately 65 MBChB, or the 5-6 BChD places becoming available in the second semester and who were therefore enrolled for MGW 112 in the first semester of the current year.*
Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration. Matrices, solutions of systems of equations. All topics are studied in the context of applications.

Calculus 143 (WTW 143)

Qualification	Undergraduate

Module credits	8.00
Programmes	BEd Senior Phase and Further Education and Training Teaching BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	BSc Extended programme and BEd programmes: WTW 133 BCom Extended programme: Students with WST 133 concurrently with WTW 143: WTW 133. Students with STK 133 concurrently with WTW 143: at least 65% for WTW 133.
Contact time	3 lectures per week, Foundation Course, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Functions: exponential and logarithmic functions, natural exponential and logarithmic functions, exponential and logarithmic laws, exponential and logarithmic equations, compound interest. Limits: concept of a limit, finding limits numerically and graphically, finding limits algebraically, limit laws without proofs, squeeze theorem without proof, one-sided limits, infinite limits, limits at infinity, vertical, horizontal and slant asymptotes, substitution rule, continuity, laws for continuity without proofs. Differentiation: average and instantaneous change, definition of derivative, differentiation rules without proofs, derivatives of polynomials, chain rule for differentiation, derivatives of trigonometric, exponential and logarithmic functions, applications of differentiation: extreme values, critical numbers, monotone functions, first derivative test, optimisation.

Mathematics 144 (WTW 144)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences
Prerequisites	WTW 133
Contact time	1 tutorial per week, Foundation Course, 3 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Functions: Rate of change, exponential functions, the natural logarithm, exponential growth and decay, proportionality, power functions, fitting formulas to data. Rates of change and the derivative: Instantaneous rate of change, the derivative function, interpretations of the derivative, the second derivative.
Differentiation: Formulas and rules, applications, extremes of a function. All topics are studied in the context of applications.

Linear algebra 146 (WTW 146)

Qualification	Undergraduate
Module credits	8.00
Programmes	BCom Statistics BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	50% for Mathematics in Grade 12
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Students will not be credited for more than one of the following modules for their degree:
WTW 124, WTW 146 and WTW 164. The module WTW 146 is designed for students who require Mathematics at 100 level only and does not lead to admission to Mathematics at 200 level.

Vector algebra, lines and planes, matrix algebra, solution of systems of equations, determinants. Complex numbers and polynomial equations. All topics are studied in the context of applications.

Calculus 148 (WTW 148)

Qualification	Undergraduate
Module credits	8.00
Programmes	BCom Statistics BSc Geoinformatics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114 GS or WTW 134 GS
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics

Period of presentation	Semester 2

Module content

*Students will not be credited for more than one of the following modules for their degree:
WTW 124, WTW 148 and WTW 164. The module WTW 148 is designed for students who require Mathematics at 100 level only and does not lead to admission to Mathematics at 200 level.

Integration techniques. Modelling with differential equations. Functions of several variables, partial derivatives, optimisation. Numerical techniques. All topics are studied in the context of applications.

Mathematical modelling 152 (WTW 152)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	50% for Mathematics in Grade 12
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

The module serves as an introduction to computer programming as used in science. Modelling of dynamical processes using difference equations; curve fitting and linear programming are studied. Applications are drawn from real-life situations in, among others, finance, economics and ecology.

Calculus 153 (WTW 153)

Qualification	Undergraduate
Module credits	8.00
Programmes	BEd Senior Phase and Further Education and Training Teaching BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences

Prerequisites	WTW 143
Contact time	Foundation Course, 1 tutorial per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Differential calculus of a single variable with proofs and applications. The mean value theorem, the rule of L'Hospital. Upper and lower sums, definite and indefinite integrals, the Fundamental theorem of Calculus, the mean value theorem for integrals, integration techniques, with some proofs.

Mathematics 154 (WTW 154)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Extended programme - Biological and Agricultural Sciences BSc Extended programme - Biological and Agricultural Sciences
Prerequisites	WTW 144
Contact time	Foundation Course, 3 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Integration: Accumulated change, the definite integral, anti-derivatives, the definite integral as an area, interpretations of the definite integral.
Matrices and systems of linear equations: Matrix addition and scalar multiplication, matrix multiplication, systems of linear equations. All topics are studied in the context of applications.

Calculus 158 (WTW 158)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Engineering and Environmental Geology BSc Engineering and Environmental Geology BSc Geology
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	60% for Mathematics in Grade 12
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics

Period of presentation	Semester 1

Module content

*This module is designed for first-year engineering students. Students will not be credited for more than one of the following modules for their degree: WTW 158, WTW 114, WTW 134, WTW 165.
Introduction to vector algebra. Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Indefinite integrals, integration.

Dynamical processes 162 (WTW 162)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Chemistry BSc Extended programme - Mathematical Sciences BSc Extended programme - Physical Sciences BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 114 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Students will not be credited for more than one of the following modules for their degree: WTW 162 and WTW 264.

Introduction to the modelling of dynamical processes using elementary differential equations. Solution methods for first order differential equations and analysis of properties of solutions (graphs). Applications to real life situations.

Mathematics 164 (WTW 164)

Qualification	Undergraduate
Module credits	16.00
Programmes	BSc Extended programme - Physical Sciences BSc Engineering and Environmental Geology BSc Extended programme - Physical Sciences BSc Geology

Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 114 GS or WTW 158 GS
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*This module is designed for first-year engineering students. Students will not be credited for more than one of the following modules for their degree: WTW 146, WTW 148 and WTW 124,

Vector algebra with applications to lines and planes in space, matrix algebra, systems of linear equations, determinants, complex numbers, factorisation of polynomials and conic sections. Integration techniques, improper integrals. The definite integral, fundamental theorem of Calculus. Applications of integration. Elementary power series and Taylor's theorem. Vector functions, space curves and arc lengths. Quadratic surfaces and multivariable functions.

Mathematics 165 (WTW 165)

Qualification	Undergraduate
Module credits	16.00
Programmes	BVSc BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Medical Sciences BSc Microbiology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Veterinary Science
Prerequisites	50% for Mathematics in Grade 12 and MGW 112# or registered for BVSc
Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 165, WTW 114, WTW 158. WTW 165 does not lead to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 165 is offered in English in the second semester only to students who have applied in the first semester of the current year for the approximately 65 MBChB, or the 5-6 BChD places becoming available in the second semester and who were therefore enrolled for MGW 112 in the first semester of the current year.

Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration, matrices, solutions of systems of equations. All topics are studied in the context of applications.

Linear algebra 211 (WTW 211)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 124
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

This is an introduction to linear algebra on Rn. Matrices and linear equations, linear combinations and spans, linear independence, subspaces, basis and dimension, eigenvalues, eigenvectors, similarity and diagonalisation of matrices, linear transformations.

Calculus 218 (WTW 218)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Chemistry BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114 and WTW 124
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Calculus of multivariable functions, directional derivatives. Extrema and Lagrange multipliers. Multiple integrals, polar, cylindrical and spherical coordinates.

Analysis 220 (WTW 220)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Chemistry BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114 and WTW 124, WTW 211 and WTW 218
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics

Period of presentation	Semester 2

Module content

Properties of real numbers. Analysis of sequences and series of real numbers. Power series and theorems of convergence. The Bolzano-Weierstrass theorem. The intermediate value theorem and analysis of real-valued functions on an interval. The Riemann integral: Existence and properties of the interval.

Linear algebra 221 (WTW 221)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 211 and WTW 218
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Abstract vector spaces, change of basis, matrix representation of linear transformations, orthogonality, diagonalisability of symmetric matrices, some applications.

Mathematics 238 (WTW 238)

Qualification	Undergraduate
Module credits	16.00
Programmes	BEng Computer Engineering Engage
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 256 and WTW 258 GS
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Separate classes for Afrikaans and English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Linear algebra, eigenvalues and eigenvectors with applications to first and second order systems of differential equations. Sequences and series, convergence tests. Power series with applications to ordinary differential equations with variable coefficients. Fourier series with applications to partial differential equations such as potential, heat and wave equations.

Vector analysis 248 (WTW 248)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	WTW 218
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Vectors and geometry. Calculus of vector functions with applications to differential geometry, kinematics and dynamics. Vector analysis, including vector fields, line integrals of scalar and vector fields, conservative vector fields, surfaces and surface integrals, the Theorems of Green, Gauss and Stokes with applications.

Differential equations 256 (WTW 256)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Mathematics BSc Mathematics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 158 and WTW 164

Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Theory and solution methods for linear differential equations as well as for systems of linear differential equations. Theory and solution methods for first order non-linear differential equations. The Laplace transform with application to differential equations. Application of differential equations to modelling problems.

Calculus 258 (WTW 258)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Mathematics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 158 and WTW 164
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Calculus of multivariable functions, directional derivatives. Extrema. Multiple integrals, polar, cylindrical and spherical coordinates. Line integrals and the theorem of Green. Surface integrals and the theorems of Gauss and Stokes.

Numerical methods 263 (WTW 263)

Qualification	Undergraduate
Module credits	8.00
Programmes	BSc Mathematics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 164
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Separate classes for Afrikaans and English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Numerical integration. Numerical methods to approximate the solution of non-linear equations, systems of equations (linear and non-linear), differential equations and systems of differential equations. Direct methods to solve linear systems of equations.

Differential equations 264 (WTW 264)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Actuarial and Financial Mathematics BSc Mathematical Statistics BSc Meteorology
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	WTW 114 and WTW 124
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Students will not be credited for both WTW 162 and WTW 264 or both WTW 264 and WTW 286 for their degree.

Theory and solution methods for ordinary differential equations and initial value problems: separable and linear first order equations, linear equations of higher order, systems of linear equations. Laplace transform.

Discrete structures 285 (WTW 285)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Chemistry BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	WTW 115
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Setting up and solving recurrence relations. Equivalence and partial order relations. Graphs: paths, cycles, trees, isomorphism. Graph algorithms: Kruskal, Prim, Fleury. Finite state automata.

Differential equations 286 (WTW 286)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Chemistry BSc Engineering and Environmental Geology BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	WTW 114, WTW 124 and WTW 162
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Students will not be credited for more than one of the modules for their degree: WTW 264, WTW 286
Theory and solution methods for ordinary differential equations and initial value problems: separable and linear first-order equations, linear equations of higher order, systems of linear equations. Application to mathematical models. Numerical methods applied to nonlinear systems.Qualitative analysis of linear systems.

Analysis 310 (WTW 310)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics

Service modules	Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities
Prerequisites	WTW 220
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Topology of finite dimensional spaces: Open and closed sets, compactness, connectedness and completeness. Theorems of Bolzano-Weierstrass and Heine-Borel. Properties of continuous functions and applications. Integration theory for functions of one real variable. Sequences of functions.

Complex analysis 320 (WTW 320)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Education
Prerequisites	WTW 218 and WTW 220
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Series of functions, power series and Taylor series. Complex functions, Cauchy- Riemann equations, Cauchy's theorem and integral formulas. Laurent series, residue theorem and calculation of real integrals using residues.

Financial engineering 354 (WTW 354)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	WST 211, WTW 211 and WTW 218
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Mean variance portfolio theory. Market equilibrium models such as the capital asset pricing model. Factor models and arbitrage pricing theory. Measures of investment risk. Efficient market hypothesis. Stochastic models of security prices

Financial engineering 364 (WTW 364)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Mathematical Statistics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Mathematical Statistics BSc Mathematics
Service modules	Faculty of Economic and Management Sciences
Prerequisites	WST 211, WTW 124, WTW 218 and WTW 286/264
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Discrete time financial models: Arbitrage and hedging; the binomial model. Continuous time financial models: The Black-Scholes formula; pricing of options and the other derivatives; interest rate models; numerical procedures.

Algebra 381 (WTW 381)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities
Prerequisites	WTW 114 and WTW 211
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Group theory: Definition, examples, elementary properties, subgroups, permutation groups, isomorphism, order, cyclic groups, homomorphisms, factor groups. Ring theory: Definition, examples, elementary properties, ideals, homomorphisms, factor rings, polynomial rings, factorisation of polynomials. Field extensions, applications to straight-edge and compass constructions.

Dynamical systems 382 (WTW 382)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 218 and WTW 286/264
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Matrix exponential function: homogeneous and non-homogeneous linear systems of differential equations. Qualitative analysis of systems: phase portraits, stability, linearisation, energy method and Liapunov's method. Introduction to chaotic systems. Application to real life problems.

Numerical analysis 383 (WTW 383)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Chemistry BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences Faculty of Humanities
Prerequisites	WTW 114, WTW 123 WTW 124 and WTW 211
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Direct methods for the numerical solution of systems of linear equations, pivoting strategies. Iterative methods for solving systems of linear equations and eigenvalue problems. Iterative methods for solving systems of nonlinear equations. Introduction to optimization. Algorithms for the considered numerical methods are derived and implemented in computer programmes. Complexity of computation is investigated. Error estimates and convergence results are proved.

Partial differential equations 386 (WTW 386)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Actuarial and Financial Mathematics BSc Actuarial and Financial Mathematics BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	WTW 248 and WTW 286/264
Contact time	2 lectures per week, 1 tutorial per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Conservation laws and modelling. Fourier analysis. Heat equation, wave equation and Laplace's equation. Solution methods including Fourier series. Energy and other qualitative methods.

Continuum mechanics 387 (WTW 387)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Meteorology BSc Applied Mathematics BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Meteorology BSc Physics
Prerequisites	WTW 248 and WTW 286/264
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Kinematics of a continuum: Configurations, spatial and material description of motion. Conservation laws. Analysis of stress, strain and rate of deformation. Linear constitutive equations. Applications: Vibration of beams, equilibrium problems in elasticity and special cases of fluid motion.

Geometry 389 (WTW 389)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Mathematical Statistics BSc Applied Mathematics BSc Chemistry BSc Geology BSc Mathematical Statistics BSc Mathematics BSc Physics
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Humanities
Prerequisites	WTW 211
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Afrikaans and English are used in one class
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Axiomatic development of neutral, Euclidean and hyperbolic geometry. Using models of geometries to show that the parallel postulate is independent of the other postulates of Euclid.

Functional analysis 710 (WTW 710)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Applied Mathematics BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics of Finance
Prerequisites	Real analysis on third-year level
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

An introduction to the basic mathematical objects of linear functional analysis will be presented. These include metric spaces, Hilbert spaces and Banach spaces. Subspaces, linear operators and functionals will be discussed in detail. The fundamental theorems for normed spaces: The Hahn-Banach theorem, Banach-Steinhaus theorem, open mapping theorem and closed graph theorem. Hilbert space theory: Riesz' theorem, the basics of projections and orthonormal sets.

Modern portfolio theory 712 (WTW 712)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering
Prerequisites	Enrolment for WTW 732 required.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Module content

An introduction to Markowitz portfolio theory and the capital asset pricing model. Analysis of the deficiencies in these methods. Sensitivity based risk management. Standard methods for Value-at-Risk calculations. RiskMetrics, delta-normal methods, Monte Carlo simulations, back and stress testing.

Axiomatic set theory and mathematical logic 724 (WTW 724)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Axiomatic set theory, ordinals, transfinite induction and recursion, ordinal arithmetic, the axiom of choice, cardinal arithmetic, the continuum hypothesis. Propositional and first order logic. The completeness and compactness theorems. Decidability, Gödel’s incompleteness theorems.

Special topics 727 (WTW 727)

Qualification	Postgraduate

Module credits	15.00
Programmes	BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling
Prerequisites	WTW 710, WTW 731, WTW 734 and WTW 724.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

A selection of special topics will be presented that reflects the expertise of researchers in the Department. The presentation of a specific topic is contingent on student numbers. Consult the website of the Department of Mathematics and Applied Mathematics for more details.

Algebra 731 (WTW 731)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis
Prerequisites	Algebra on third-year level
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

The following topics will be covered: Galois theory and solving equations by radicals, introduction to the theory of R-modules, direct sums and products, projectivity and injectivity, finitely generated modules over Euclidean domains, primary factorisation, applications to Jordan and rational canonical forms of matrices.

Mathematical models of financial engineering 732 (WTW 732)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematics of Finance
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Introduction to markets and instruments. Futures and options trading strategies, exotic options, arbitrage relationships, binomial option pricing method, mean variance hedging, volatility and the Greeks, volatility smiles, Black-Scholes PDE and solutions, derivative disasters.

Numerical analysis 733 (WTW 733)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Applied Mathematics BScHons Financial Engineering BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

An analysis as well as an implementation (including computer programs) of methods are covered. Numerical linear algebra: Direct and iterative methods for linear systems and matrix eigenvalue problems: Iterative methods for nonlinear systems of equations. Finite difference method for partial differential equations: Linear elliptic, parabolic, hyperbolic and eigenvalue problems. Introduction to nonlinear problems. Numerical stability, error estimates and convergence are dealt with.

Measure theory and probability 734 (WTW 734)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	Real analysis on third-year level
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Measure and integration theory: The Caratheodory extension procedure for measures defined on a ring, measurable functions, integration with respect to a measure on a ?-ring, in particular the Lebesgue integral, convergence theorems and Fubini's theorem.
Probability theory: Measure theoretic modelling, random variables, expectation values and independence, the Borel-Cantelli lemmas, the law of large numbers. L^1-theory, L^2-theory and the geometry of Hilbert space, Fourier series and the Fourier transform as an operator on L^2, applications of Fourier analysis to random walks, the central limit theorem.

Main principles of analysis in application 735 (WTW 735)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Applied Mathematics BScHons Financial Engineering BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling
Prerequisites	Calculus at 2nd-year level (eg WTW 218) and one 3rd-year level module on analysis or applications of analysis (eg WTW 310, WTW 382, WTW 383 or WTW 386)
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Study of main principles of analysis in the context of their applications to modelling, differential equations and numerical computation. Specific principles to be considered are those related to mathematical biology, continuum mechanics and mathematical physics as presented in the modules WTW 772, WTW 787 and WTW 776, respectively.

Mathematical optimisation 750 (WTW 750)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics of Finance BScHons Applied Mathematics BScHons Financial Engineering BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	Multivariate Calculus on 2nd-year level; Linear Algebra on 2nd-year level
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Classical optimisation: Necessary and sufficient conditions for local minima. Equality constraints and Lagrange multipliers. Inequality constraints and the Kuhn-Tucker conditions. Application of saddle point theorems to the solutions of the dual problem. One-dimensional search techniques. Gradient methods for unconstrained optimisation. Quadratically terminating search algorithms. The conjugate gradient method. Fletcher-Reeves. Second order variable metric methods: DFP and BFCS. Boundary following and penalty function methods for constrained problems. Modern multiplier methods and sequential quadratic programming methods. Practical design optimisation project.

Mathematical models of financial engineering 762 (WTW 762)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematics of Finance
Prerequisites	WTW 732 or WTW 364
Contact time	2 lectures per week
Language of tuition	Module is presented in English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Exotic options, arbitrage relationships, Black-Scholes PDE and solutions, hedging and the Miller-Modigliani theory, static hedging, numerical methods, interest rate derivatives, BDT model, Vasicek and Hull-White models, complete markets, stochastic differential equations, equivalent Martingale measures.

Finite element method 763 (WTW 763)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Financial Engineering BScHons Applied Mathematics BScHons Financial Engineering BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	WTW 733 is strongly recommended
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

An analysis as well as an implementation (including computer programs) of methods is covered. Introduction to the theory of Sobolev spaces. Variational and weak formulation of elliptic, parabolic, hyperbolic and eigenvalue problems. Finite element approximation of problems in variational form, interpolation theory in Sobolev spaces, convergence and error estimates.

Stochastic calculus 764 (WTW 764)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance

Prerequisites	WTW 734 or WTW 735
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Mathematical modelling of Random walk. Conditional expectation and Martingales. Brownian motion and other Lévy processes. Stochastic integration. Ito's Lemma. Stochastic differential equations. Application to finance.

Mathematical methods and models 772 (WTW 772)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics of Finance BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

This module aims at using advanced undergraduate mathematics and rigorously applying mathematical methods to concrete problems in various areas of natural science and engineering.
The module will be taught by several lecturers from UP, industry and public sector. The content of the module may vary from year to year and is determined by relevant focus areas within the Department. The list of areas from which topics to be covered will be selected, includes: Systems of differential equations; dynamical systems; discrete structures; Fourier analysis; methods of optimisation; numerical methods; mathematical models in biology, finance, physics, etc.

Partial differential equations of mathematical physics 776 (WTW 776)

Qualification	Postgraduate
Module credits	15.00

Programmes	BScHons Mathematics of Finance BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	WTW 710 or WTW 735
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Field-theoretic and material models of mathematical physics. The Friedrichs-Sobolev spaces. Energy methods and Hilbert spaces, weak solutions – existence and uniqueness. Separation of variables, Laplace transform, eigenvalue problems and eigenfunction expansions. The regularity theorems for elliptic forms (without proofs) and their applications. Weak solutions for the heat/diffusion and related equations.

Continuum mechanics 787 (WTW 787)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Applied Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Analysis of spatial versus material description of motion. Conservation laws. Derivation of stress tensors. Analysis of finite strain and rate of deformation tensors. Stress and strain invariants. Energy. Linear and nonlinear constitutive equations. Applications to boundary value problems in elasticity and fluid mechanics.

Topology 790 (WTW 790)

Qualification	Postgraduate
Module credits	15.00
Programmes	BScHons Mathematics BScHons Mathematics
Prerequisites	Real analysis on third-year level
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

General topology: Concepts such as convergence, compactness, connectedness, separation axioms and continuity are introduced in topological spaces. Their basic properties are treated. Important topologies like the product topology and the quotient topology are discussed.
Algebraic topology: Homotopy, the fundamental group, covering spaces, homotopy type.

Project 792 (WTW 792)

Qualification	Postgraduate
Module credits	30.00
Programmes	BScHons Financial Engineering BScHons Financial Engineering BScHons Mathematics of Finance
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Module content

Consult Department.

Project 795 (WTW 795)

Qualification	Postgraduate
Module credits	30.00

Programmes	BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Applied Mathematics BScHons Mathematics BScHons Mathematics and Mathematics Education Algebra and Analysis BScHons Mathematics and Mathematics Education Applied Analysis BScHons Mathematics and Mathematics Education Differential Equations and Modelling BScHons Mathematics of Finance
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Module content

Consult Department.

Convergence spaces 812 (WTW 812)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Topology, Measure Theory and Functional Analysis on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Filters. Convergence of filters, sequences and nets in a topological space. Convergence structures, basic properties and constructs. Continuous convergence, c-embedded convergence spaces. Order convergence on lattices and posets. Convergence vector spaces and completions. Continuous convergence and duality on locally convex spaces. The Hahn-Banach theorem in convergence spaces.

Mathematical morphology 820 (WTW 820)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Measure Theory and Functional Analysis on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics

Period of presentation	Semester 1

Module content

Mathematical morphology – a theory for the analysis of special structures and a powerful methodology for the extraction of useful information from images. Morphological operators and their properties: erosion, dilation, opening, closing, granulometries. Applications to noise removal, filtering, extraction of features, edge detection, etc. LULU operators - properties and applications. Partial differential equations for morphological operators.

Mathematical and computational finance 831 (WTW 831)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Financial Engineering on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master’s module in a particular year.
Stochastic Calculus: Multidimensional Itô formula, correlated Wiener processes, the infinitesimal operator, SDE's, PDE's, the Kolmogorov equations, martingales, stochastic integral representations and Gisanov's theorem. The martingale approach to arbitrage theory. Bonds and interest rates: Martingale models, standard models, the Heath-Jarrow-Morton framework. Monte Carlo methods. Finite difference methods.

Advanced methods of financial engineering 832 (WTW 832)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Financial Engineering on honours level
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Module content

*Consult with the head of the department of Mathematics and Applied Mathematics about the availability of this master’s module in a particular year.
Interest rate derivatives. Stochastic volatility models. Models to improve on the flaws in the Black-Scholes model. Principles of deal structuring. Principles of mathematical models. Specialised methods for interest rate and exotic derivatives. Application of numerical methods to relevant practical problems.

Quantitative risk management 833 (WTW 833)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Financial Engineering on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Module content

*Consult with the head of the department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Risk in perspective. Traditional RiskMetrics. Methods to calculate VaR. Designing scenario analyses and stress analysis. Risk measures based on loss distributions. Aggregate risk measures which include coherent risk measures. Extreme value theory. Correlation, copulas and dependence. Credit risk management.

Homogenisation of partial differential equations 836 (WTW 836)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Functional Analysis, Measure Theory, Partial Differential Equations at honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied
Mathematics about the availability of this master's module in a particular year.
Review of functional analysis, Sobolev spaces and variational problems; rapidly oscillating function; periodic composite materials; homogenisation of elliptic problems; multiple scale method; two-scale convergence and applications.

Special functions and approximation theory 840 (WTW 840)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Complex Analysis at 3rd-year level; Advanced Calculus and Ordinary Differential equations (ODEs)
Contact time	1 lecture per week
Language of tuition	Module is presented in English

Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
The Gamma and Beta functions, the hypergeometric function, orthogonal polynomials and their properties, classical orthogonal polynomials such as Chebychev, Hermite, Laguerre, Ultraspherical and Jacobi polynomials, Padé approximation, applications of zeros of orthogonal polynomials to convergence of Padé approximants.

Stochastic partial differential equations 846 (WTW 846)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Functional analysis, Measure theory, Partial differential equations at honours level. Knowledge of Probability theory is advised but not required
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Generalities on probability theory (random variables, conditional expectations); Martingales; stochastic integrals; Markov processes; existence and uniqueness results for ordinary stochastic differential equations; Sobolev spaces, Aubin-Dubinsky-Simon compactness theorem; convergence of probability measures: Prokhorov and Skorokhod theorems; existence and uniqueness of solutions of stochastic parabolic equations in divergence form: The Galerkin scheme; idea of renormalization group theory in turbulent flows modelled by Navier-Stokes equations with random forcing.

Mathematical epidemiology 850 (WTW 850)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Dynamical systems, Ordinary differential equations (ODEs)
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
The spread of infections is modelled via dynamical systems defined by sets of differential equations. Compartmental models of the spread of contagious infection (e.g. MSEIR) and models of vector borne diseases are considered. Methods of analysis of the local and global asymptotic stability of the disease free and endemic equilibria and their characterization in terms of the basic reproduction number. Reliable numerical simulations and sensitivity analysis with respect to the parameters of the models.

Introduction to categories and sheaves 851 (WTW 851)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Algebra at 3rd-year and honours levels
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
The language of categories; limits; additive and abelian categories; abelian sheaves; cohomology of sheaves; homotopy and fundamental groupoid.

Lattice theory 855 (WTW 855)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Algebra at 3rd-year level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
The following topics will be studies: Ordered sets; down-sets of ordered sets; lattices and complete lattices; modular, distributive and Boolean lattices (as algebras and as ordered sets); the representation of lattices by collections of sets; the lattice of congruences of a lattice; complete partially ordered sets and fixed point theorems and maximality principles.

Finite element analysis 863 (WTW 863)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Finite element method and Functional analysis at honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Finite element interpolation theory. Finite element approximation of elliptic boundary value problems and eigenvalue problems. Finite element approximation of parabolic and hyperbolic initial value problems. Applications in a project.

Graph theory 865 (WTW 865)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Discrete structures at 3rd-year level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
The basics (including a variety of topics); matchings; connectivity; planarity; colourings and generalised colourings and hereditary properties of graphs.

Hyperbolic systems of partial differential equations 866 (WTW 866)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Partial differential equations at 3rd-year and hons level; Advanced calculus and Linear algebra
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics

Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Systems of first order partial differential equations and their relationship to wave phenomena. The course will show that the traditional wave equation is over-rated as study material. More detailed contents: Hyperbolicity of first order systems (linear and nonlinear); characteristic curves and surfaces; domains of influence and dependence; well-posedness of initial and boundary value problems; shock phenomena; numerical calculation of solutions; application to the equations of compressible gas dynamics and Maxwell's equations for electromagnetism.

Differential geometry 869 (WTW 869)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Linear algebra, Differential and Integral calculus, Partial differential equations at hons level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1 or Semester 2

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Differentiable manifolds; multilinear algebra; exterior differential calculus; integration of differential forms and De Rham cohomology; connections on frame bundles; Riemannian manifolds and submanifolds; second fundamental form; harmonic mappings between Riemannian manifolds.

Sobolev spaces 880 (WTW 880)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Measure theory, Differential equations and Functional analysis on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Consult with the Head of Department of Mathematics and Applied Mathematics about the availability of this master's course in a particular year.
Mathematics about the availability of this masters module in a particular year.The module focuses on the Hilbertion Sobolev spaces as well as to their applications to elliptic boundary value problems. Topics to be discussed include: Distributions; Sobolev spaces of positive and negative integer orders; Sobolev spaces of traces; Embeddings of Sobolev spaces; Boundary value problems.

Abstract analysis 881 (WTW 881)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Measure Theory and Functional Analysis on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Capita selecta from the following: Duality theory. Weak and Weak* topologies. The Krein- Milman theorem. The Stone-Weierstrass theorem. Fixed point theorems. Banach Algebras and the Gelfand transform. C*-algebras and their representations. Semigroups of operators. Functional analysis applied to probability theory and stochastics.

Advanced measure theory 884 (WTW 884)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Measure Theory and Functional Analysis on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Lebesgue integral in a general measure space: Basic properties, convergence theorems, convergence in measure. Lebesgue spaces: Completeness, approximation by continuous functions. Complex measures: Absolute continuity, Random-Nikodym Theorem, representation of bounded linear functionals on Lebesgue spaces, Riesz Representation Theorem for bounded linear functionals on the space of continuous functions on a locally convergent Hausdorff space where X is a locally compact Hausdorff space. Applications to probability.

Mathematics 886 (WTW 886)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Refer to the Department regarding the module content.

Dynamical systems 887 (WTW 887)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	Functional Analysis, Partial Differential Equations and Finite Element Method on honours level
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Finite dimensional dynamical systems: Autonomous and non-autonomous systems of differential equations, dynamical systems, linear and nonlinear systems, existence and uniqueness of solutions, extension of solutions, maximal solution and maximal interval of existence, phase space and phase portrait. Stability theory for equilibria and periodic orbits using linear approximation, Liapunov's method and other energy methods and discrete dynamical systems (Poincarè map). Introduction to strange attractors. Application to mechanics and population models. Infinite dimensional dynamical systems: Semigroups, first and second order abstract differential equations, Sobolev spaces, finite dimensional approximation. Application to heat conduction and mechanical vibration. Examples of nonlinear systems.

Special topics in mathematics 888 (WTW 888)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	No prerequisites.

Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Content will vary from time to time depending on the availability of expertise in the Department.

Mathematics 889 (WTW 889)

Qualification	Postgraduate
Module credits	0.00
Prerequisites	No prerequisites.
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

Consult with the Head of the Department of Mathematics and Applied Mathematics about the availability of this master's module in a particular year.
Refer to the Department regarding the module content.

Dissertation: Mathematics of finance 892 (WTW 892)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Mathematics of Finance MSc Mathematics of Finance
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Dissertation: Mathematics education 893 (WTW 893)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Mathematics Education MSc Mathematics Education
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Dissertation: Financial engineering 894 (WTW 894)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Financial Engineering MSc Financial Engineering
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Doctoral Oral 990 (WTW 990)

Qualification	Postgraduate
Module credits	360.00
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Thesis: Mathematics Education 993 (WTW 993)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Science and Mathematics Education PhD Science and Mathematics Education
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Year

Animal diversity 161 (ZEN 161)

Qualification	Undergraduate
Module credits	8.00

Programmes	BSc Chemistry BSc Biochemistry BSc Biological Sciences BSc Biotechnology BSc Chemistry BSc Ecology BSc Entomology BSc Environmental Sciences BSc Extended programme - Biological and Agricultural Sciences BSc Food Science BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology BScAgric Agricultural Economics and Agribusiness Management BScAgric Animal Science BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education Faculty of Veterinary Science
Prerequisites	MLB 111 GS or permission from the HOD.
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

Animal classification, phylogeny, organization and terminology. Evolution of the various animal phyla, morphological characteristics and life cycles of parasitic and non-parasitic animals. Structure and function of reproductive, respiratory, excretory, circulatory and digestive systems.

Invertebrate biology 251 (ZEN 251)

Qualification	Undergraduate
Module credits	12.00

Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Ecology BSc Entomology BSc Environmental Sciences BSc Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology
Service modules	Faculty of Education
Prerequisites	ZEN 161 GS or permission from the HOD.
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 1

Module content

Origin and extent of modern invertebrate diversity; parasites of man and domestic animals; biology and medical importance of arachnids; insect life styles; the influence of the environment on insect life histories; insect phytophagy, predation and parasitism; insect chemical, visual, and auditory communication; freshwater invertebrates and their use as biological indicators.

African vertebrates 261 (ZEN 261)

Qualification	Undergraduate
Module credits	12.00
Programmes	BSc Human Physiology BSc Biochemistry BSc Biotechnology BSc Ecology BSc Entomology BSc Environmental Sciences BSc Genetics BSc Human Physiology BSc Microbiology BSc Plant Science BSc Zoology
Service modules	Faculty of Education
Prerequisites	ZEN 161 GS or permission from the HOD.
Contact time	4 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology

Period of presentation	Quarter 3

Module content

Introduction to general vertebrate diversity; African vertebrate diversity; vertebrate structure and function; vertebrate evolution; vertebrate relationships; aquatic vertebrates; terrestrial ectotherms; terrestrial endotherms; vertebrate characteristics; classification; structural adaptations; habits; habitats; conservation problems; impact of humans on other vertebrates.

Population ecology 351 (ZEN 351)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Environmental Sciences BSc Ecology BSc Entomology BSc Environmental Sciences BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 1

Module content

Scientific approach to ecology; evolution and ecology; the individual and its environment; population characteristics and demography; competition; predation; plant-herbivore interactions; regulation of populations; population manipulation.

Mammalogy 352 (ZEN 352)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Genetics BSc Biochemistry BSc Genetics BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology

Period of presentation	Quarter 1

Module content

Mammalian origins and their characteristics: evolution of African mammals; structure and function: integument, support and movement; foods and feeding; environmental adaptations; reproduction; behaviour; ecology and biogeography; social behaviour; sexual selection; parental care and mating systems; community ecology; zoogeography. Special topics: parasites and diseases; domestication and domesticated mammals; conservation.

Community ecology 353 (ZEN 353)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Environmental Sciences BSc Ecology BSc Entomology BSc Environmental Sciences BSc Zoology
Service modules	Faculty of Education
Prerequisites	ZEN 351 (50%) (Note: Prerequisite not applicable to students enrolled for a dual major in Zoology and Plant Science).
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 4

Module content

The scientific approach; characteristics of the community; the community as a superorganism; community changes; competition as a factor determining community structure; disturbance as a determinant of community structure; community stability; macroecological environmental gradients and communities. A field trip will be conducted during the September vacation to the Sani Pass region of the Maloti-Drakensberg Mountains.

Evolutionary physiology 354 (ZEN 354)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Genetics BSc Biochemistry BSc Entomology BSc Genetics BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 2 practicals per week

Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 2

Module content

This module focuses on the integration of physiological systems in the context of animal form and function, and the ways in which evolution shapes the physiological processes that determine the energy, water and nutrient fluxes between animals and their environments. Topics covered include: (i) circulation, gas exchange and excretion; (ii) nutritional ecology; (iii) osmoregulation and thermoregulation; and (iv) reproductive physiology. The major focus of this module is to understand the major sources of physiological diversity, namely scaling, phylogenetic inertia, adaptation and phenotypic plasticity, and applying this knowledge to conceptually link physiological processes at the cellular level to macrophysiological patterns at a global scale.

Insect diversity 355 (ZEN 355)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Plant Science BSc Entomology BSc Genetics BSc Microbiology BSc Plant Science
Service modules	Faculty of Education
Prerequisites	ZEN 251 GS or permission from the HOD.
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 1

Module content

The extent and significance of insect diversity. Functional insect morphology. The basic principles of taxonomy and the classification of taxa within the Insecta. Insect orders and economically and ecologically important Southern African insect families. Identification of insect orders and families using distinguishing characteristics. General biological and behavioural characteristics of each group. Grouping of insects into similar life-styles and habitats.

Physiological processes 361 (ZEN 361)

Qualification	Undergraduate
Module credits	18.00

Programmes	BSc Genetics BSc Biochemistry BSc Ecology BSc Entomology BSc Genetics BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 3

Module content

This module focuses on the means by which animals can sense and respond to the external and internal environment. Topics covered include: (i) the structure and function of biological membranes; (ii) neurons and nervous systems; (iii) sensing the environment; (iv) glands, hormones and regulation of development and growth; (v) muscles and animal movement and (vi) the initiation and control of behaviour. The implications of these physiological processes for animal conservation and management will be emphasised. A comparative approach will be adopted throughout the module to highlight the commonalities as well as the ways in which animal lineages have achieved similar functional outcomes from different structural adaptations.

Evolution and phylogeny 362 (ZEN 362)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Entomology BSc Ecology BSc Entomology BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 3

Module content

Evolution as a process and pattern, prime movers in evolution: Selection, drift, general population genetics. Population differentiation, clines, subspecies and species, adaptation as a major force in evolution and the panglossian paradigm, molecular evolution. Phylogeography, phylogenetic reconstruction. Evolutionary biogeography. Adaptation, Darwin's formulation, proximate and ultimate causation, genetic and developmental constraints, optimality. Phenotypic models, the comparative method, convergent evolution. Evolution of complex biological systems, origin of life and sex, macro-evolution, punctuated equilibrium, human evolution. Levels of selection. Species concepts.

Behavioural ecology 363 (ZEN 363)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Genetics BSc Biochemistry BSc Environmental Sciences BSc Genetics BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 4

Module content

The history of behavioural ecology. A causal, developmental, evolutionary and adaptive approach. Sensory systems and communication. Sexual selection, mate choice and sperm competition. Kin selection and group living. Special reference to social insects. The behavioural ecology of humans. Phylogenetic basis of behavioural analysis. The role of behavioural ecology in conservation planning.

Conservation ecology 364 (ZEN 364)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Plant Science BSc Ecology BSc Entomology BSc Environmental Sciences BSc Plant Science BSc Zoology
Service modules	Faculty of Education
Prerequisites	No prerequisites.

Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 2

Module content

This module is intended to provide students with the skills and knowledge that are essential for the conservation of biodiversity. The module focuses on conservation theory and practice (e.g. endangered species, habitat loss, overexploitation, climate change), and has a practical component. The students will be actively involved in planning and executing field projects, and will be responsible for analysing and presenting the results. The students will gain valuable theoretical and practical experience in the field of conservation ecology by being exposed to a number of different taxa.

Applied entomology 365 (ZEN 365)

Qualification	Undergraduate
Module credits	18.00
Programmes	BSc Microbiology BSc Entomology BSc Genetics BSc Microbiology BScAgric Applied Plant and Soil Sciences BScAgric Plant Pathology
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	4 lectures per week, 2 practicals per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Quarter 4

Module content

*It is strongly recommended that students first complete ZEN 355: Insect diversity 355
Impact of insects on economies, human health and well-being. Protection of corps from insect herbivores through monitoring, forecasting and application of the principles of integrated pest management; epidemiology and modern developments in the control of insect vectors of human and animal diseases; insects as a tool in forensic investigations; ecological and economic significance of insect pollinators and current threats to their survival and health. Lecturers will be complemented by practical experiences that provide students with skills in the design, conduct, analysis, interpretation and reporting of applied entomological research.

Research project 701 (ZEN 701)

Qualification	Postgraduate
Module credits	68.00

Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1 or Semester 2

Module content

Research project

Systematics, evolution and biogeography 703 (ZEN 703)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	20 lectures per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

The object of this module is to introduce students to several contemporary problem areas in systematics, evolutionary theory and biogeography, and to use this as a basis for exploring current approaches and methods in systematics.

Environmental physiology 704 (ZEN 704)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

Photoperiodism and chronobiology – the ability of animals to measure daylength, the concept of circadian rhythm and the nature of the clock which drives such processes. Water availability and temperature – physiological responses of animals to changing water availability and temperature in the context of global climate change. Regulation of reproduction – physiological mechanisms which couple reproduction to external and internal environmental factors.

Principles in applied ecology 705 (ZEN 705)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

The module focuses on forces that drive population and community patterns and processes across temporal and spatial scales. Attention is given to the scientific application of ecological and macro-ecological principles that relate to short- and long-term population and community responses to environmental change. Group discussions based on current literature provide opportunities to apply theoretical principles to problem solving.

Integrated pest management in Africa 707 (ZEN 707)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	1 discussion class per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

Pest outbreaks and the practice of integrated pest management using different control methods; philosophy of IPM; socio-economic implications; politics and legislation; pest models; decision tools and techniques.

Mammal ecology 710 (ZEN 710)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

Contemporary issues in mammal ecology; the focus will be on current understanding at individual, population, community and ecosystem levels.

Behavioural ecology 712 (ZEN 712)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

The use of ecological and evolutionary processes to explain the occurrence and adaptive significance of behaviour patterns. Empirical, comparative analyses relating behaviour to environment will be addressed, including the use of behavioural processes to predict ecological patterns.

Research methods and scientific communication 713 (ZEN 713)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1 or Semester 2

Module content

Basic skills in philosophy of science; research planning; scientific writing; scientific public speaking; an essay, two oral presentations, prescribed reading and an oral exam.

Insect-plant interactions 782 (ZEN 782)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

An overview of the complex world of insect-plant interactions. Insects and plants have co-occurred and co-evolved on this planet for at least 400 million years, and in many systems insects are the primary consumers of plant tissue. The diverse strategies and counter-strategies that have evolved at the interface between herbivory and plant defences will be examined, using case studies and applying unifying theory wherever possible.

Global climate change and biodiversity 783 (ZEN 783)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	1 lecture per week, 3 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 1

Module content

The module aims to provide students with an understanding of global climate change and its impact on the conservation of biodiversity.

Contemporary research techniques 784 (ZEN 784)

Qualification	Postgraduate
Module credits	13.00
Programmes	BScHons Entomology BScHons Entomology BScHons Zoology
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 2

Module content

Stable isotope ecology – applications of stable isotope-based techniques in zoological research, including (i) tracking animal movements, (ii) dietary reconstruction, (iii) delineation of trophic levels, (iv) tracing nutrient allocation to reproduction, (v) forensic applications, and (vi) doubly-labelled water and water tracer applications. Stress hormones – the spectrum of stress molecules, how they are regulated, what their impacts are, and how they are measured to reflect acute and chronic stress. Photogrammetry – (i) appropriate equipment for photogrammetry, (ii) photographic techniques for photogrammetric use, (iii) photogrammetry software, (iv) building three-dimensional models, (v) measuring models. Applications of molecular biology to conservation genetics, infectious disease epidemiology and ecology, forensics (host and pathogen-based) and diagnostics.

Conservation planning and monitoring 808 (ZEN 808)

Qualification	Postgraduate
Module credits	15.00
Programmes	MSc Environmental Ecology (Coursework) MSc Environmental Ecology (Coursework)
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Biodiversity survey techniques; data and information management; data assessment; principles of data extrapolation; inventories; biodiversity risk assessment (PHVA, small and declining population paradigms, prioritisation); principles of reserve selection; surrogacy; reserve design; integrated land-use planning. Landscape theories and models (hierarchy, percolation, metapopulation, source-sink); scaling patterns and processes across landscapes (patches, corridors, mosaics and flows); emerging patterns and processes; principles of landscape dynamics; principles of landscape conservation, management and design (transformation, fragmentation); methods in landscape ecology (numerical and spatial data processing, fractal geometry approach, GIS, remote sensing, GPS, spatially explicit population models).
Skills: GradSect, Access, Excel, Visual Basic, GIS (Arc View) reserve selection algorithms.

Biogeography and macro-ecology 809 (ZEN 809)

Qualification	Postgraduate
Module credits	15.00
Programmes	MA Environment and Society (Coursework) MSc Environmental Ecology (Coursework)
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Biogeographic consequences of plate tectonics, Pleistocene southern African climatic, geological, edaphic and geomorphological patterns. Reconstructing biogeographic histories (speciation, extinction, dispersal, vicariance, endemism, provincialism and disjunction); phytogeographical patterns, biomes, vegetation types. Methodological issues in macro-ecology; patterns of body size, abundance and energetics; geographic range sizes; species dynamics in landscapes; implications of macro-ecological patterns to ecology; biogeography and evolution; macro-ecological perspectives on conservation: species richness, hierarchical diversity, hotspots, spatial and temporal patterns in diversity (genetic, taxonomic, functional); causal mechanisms, species diversity, biodiversity and global change.

Conservation and development 811 (ZEN 811)

Qualification	Postgraduate
Module credits	30.00
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

An international perspective on human resource utilisation and its global effects. The problems of implementing conservation measures in the face of human development. Conservation as an economic process.

Populations and communities: Spatial and temporal variability 872 (ZEN 872)

Qualification	Postgraduate
Module credits	30.00
Prerequisites	No prerequisites.
Contact time	4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Demography with emphasis on forces affecting population growth rate and regulation; competition and facilitation within and between populations; risk and risk assessment; temporal trends and extinction; management, harvesting and control with emphasis on illustrating principles using studies conducted in Africa. Structure, composition and function of communities with emphasis on factors affecting resilience, resistance and persistence; temporal variability with emphasis on the influences of foodwebs structure and environmental variability; spatial pattern analysis; species-abundance relations; species affinities; community classification.

Conservation in practice 875 (ZEN 875)

Qualification	Postgraduate
Module credits	30.00
Prerequisites	No prerequisites.
Contact time	1 other contact session per week, 4 discussion classes per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Conceptual issues in the management of small populations; captive propagation; control of invasive species; control of problem populations; restoration of species and communities; conservation education, and involvement of local communities in conservation programmes; monitoring techniques and data handling; design and interpretation of laboratory and field experiments to solve ecological and conservation problems.

Research Project 891 (ZEN 891)

Qualification	Postgraduate
Module credits	120.00
Prerequisites	No prerequisites.

Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Module content

Research projects may be based either on fieldwork, laboratory work, experiments or the analysis of existing data sets. This decision must be taken in consultation with the candidate's designated project supervisor. The choice of project topic will be determined to a very large extent by the time available for data collection and analysis.
Students should select and approach a potential supervisor based on their own interests and that of the supervisors. A list of projects may be made available, although the students may choose their own project as long as a supervisor agrees to it. Joint supervision of projects by more than one person at the University, or one person from outside the University, is also possible.
The purpose of the research project is to provide students with a thorough grounding in the planning, execution, analysis and scientific writing stages of a research project. Students must complete the background reading, design the objectives and perform the observations and/or experiments pertaining to the chosen project, as well as the analysis and compilation of the results and discussion in the form of a scientific publication. The project should be formatted for submission to a scientific journal.

Dissertation: Zoology 890 (ZOO 890)

Qualification	Postgraduate
Module credits	180.00
Programmes	MSc Zoology MSc Zoology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

Thesis: Zoology 990 (ZOO 990)

Qualification	Postgraduate
Module credits	360.00
Programmes	PhD Zoology PhD Zoology
Prerequisites	No prerequisites.
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Year

The information published here is subject to change and may be amended after the publication of this information. The General Regulations (G Regulations) apply to all faculties of the University of Pretoria. It is expected of students to familiarise themselves well with these regulations as well as with the information contained in the General Rules section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.