FACULTIES OF THE UNIVERSITY OF PRETORIA

HUMANITIES

NATURAL AND AGRICULTURAL SCIENCES

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ISBN 978-1-77592-052-6

FACULTY OF NATURAL AND AGRICULTURAL SCIENCES

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- Insurance and Actuarial Science
- Mathematics and Applied Mathematics
- Microbiology and Plant Pathology
- Physics
- Physiology
- Plant Production and Soil Science
- Plant Science
- Statistics
- Zoology and Entomology

TABLE OF CONTENTS

FACULTY OF NATURAL AND AGRICULTURAL SCIENCES

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AS ON 30 SEPTEMBER 2013

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Kufakunesu, R., BSc(Hons) MSc DPhil(Zimbabwe)....Lecturer
Mabula, M.D., MSc(Witwatersrand) PhD(Cape Town)....Lecturer
Mostert, L., BSc(Hons) MSc(Potchefstroom)....Lecturer
Moubandjo, D.V., BSc(Hons)(USTM) PhD(Stellenbosch)....Lecturer
Van der Hoff, Q., BA(Hons)(Pretoria) MSc(Southern Mississippi)
DTech(TUT)....Lecturer
Van Zyl, A.J., MSc PhD(Pretoria)....Lecturer
Verwey, A., BSc(Hons) MSc(Pretoria)....Lecturer
Vetrik, T., MSc(Constantine the Philosopher Univ, Slovakia)
PhD(Slovak Univ of Technology)....Lecturer
Basson, M., BSc(Hons), MSc(Pretoria)....Junior Lecturer
Ostaszewicz, A.J., BSc(Hons) MSc(Pretoria)....Junior Lecturer
Van Wyk, D.W., BSc(Hons)(Pretoria)....Junior Lecturer
Wiggins, H.Z., BSc(Hons) MSc(Cape Town)....Junior Lecturer
Yani, B.M., BSc(Hons) MSc(Pretoria)....Junior Lecturer

Department of Microbiology and Plant Pathology

Venter, S.N., MSc PhD(Pretoria)....Associate Professor (Head)
Ashton, P.J., BSc(Hons) MSc PhD(Rhodes)....Extraordinary Professor
Brözel, V.S., MSc PhD(Pretoria)....Extraordinary Professor
Kfir, R., MSc (Weizmann Institute) DSc(Pretoria)..... Extraordinary Professor
Paweska, J.T., BVSc DVSc Dr hab....Extraordinary Professor
Rupprecht, C.E., BA(Rutgers Univ) MSc(Wisconsin)
VMD(Pennsylvania) PhD(Wisconsin)....Extraordinary Professor
Pietersen, G., MSc(Pretoria) PhD(Witwatersrand)....Extraordinary Professor
Coutinho, T.A., BSc(Hons) MSc PhD(Natal)....Professor
Nel, L.H., MSc(Free State) PhD(Pretoria)....Professor
Korsten, L., BSc(Hons)(Stellenbosch) MSc PhD(Pretoria)....Professor
Roux, J., MSc PhD(Free State)....Professor
Theron, J., BSc(Hons) MSc PhD(Pretoria)....Professor
Aveling, T.A.S., MSc PhD(Natal)....Associate Professor

Labuschagne, N., MSc(Agric) DSc(Agric)(Pretoria) PrSciNat.....Associate Professor
Markotter, W., BSc(Hons) MSc PhD(Pretoria).....Associate Professor
Steenkamp, E.T., BSc(Hons) MSc (Free State) PhD(Pretoria).....Associate Professor
Moleleki, L.N., BSc(Hons) MSc(KwaZulu-Natal)
PhD(Univ of Dundee, UK).....Senior Lecturer
Thantsha, M., BSc(Hons)(Univ of the North) MSc PhD(Pretoria).....Senior Lecturer
Van der Waals, J.E., MSc(Agric) PhD(Pretoria) .....Senior Lecturer
Anelich, L., MSc(Pretoria) PhD(Free State).....Extraordinary Lecturer
Maree, F.F., MSc, PhD(Pretoria).....Extraordinary Lecturer
Weyer, W., PhD(Pretoria) .....Extraordinary Lecturer

Department of Physics
Theron, C.C., BSc(Hons)(Port Elizabeth)
MSc PhD(Stellenbosch).....Professor (Head)
Chakraborty, P., MSc PhD(Calcutta, India) .....Honorary Professor
Grayson, D.J., MSc PhD(Univ Washington)
PhD h.c.(Umea Univ Sweden) .....Honorary Professor
Gries, W., BSc MSc(Pretoria) PhD(Stellenbosch) .....Honorary Professor
Russel, F.M., PhD(University College London) .....Honorary Professor
Van der Merwe, J.H., MSc(Appl Maths)(Stellenbosch)
MSc(Maths)(Pretoria) PhD(Bristol).....Honorary Professor
Boeyens, J.C.A, MSc(Free State) DSc(Pretoria) FRSSA .....Extraordinary Professor
Friedland, E.K.H., MSc DSc(Pretoria) .....Extraordinary Professor
Alberts, H.W., BSc(Hons) MSc(Potchefstroom) DSc(Pretoria) .....Emeritus Professor
Auret, F.D., MSc(Physics) MSc(Appl Maths) DSc(Pretoria).....Emeritus Professor
Bredell, L.J., MSc DSc(Pretoria) .....Emeritus Professor
Kunert, H.W., MSc(Poznan) PhD(Warszawa) .....Emeritus Professor
Malherbe, J.B., MSc DSc(Pretoria) .....Emeritus Professor
Van Staden, J.C., MSc(Pretoria) Dr Rer Nat(Heidelberg) .....Emeritus Professor
Van der Berg, N.G., BSc(Port Elizabeth) MSc(Unisa) .....Emeritus Senior
DSc(Pretoria).....Lecturer
Booth, R., MSc(Univ Belfast) PhD(Manchester) ..... Professor
Chetty, N., BSc(Hons)(Natal) MS PhD(Illinois) .....Professor
Rakitianski, S., MSc(Tashkent) PhD(Joint Institute for Nuclear
Research, Dubna, Russia).....Professor
Selyshchev, P., PhD(Inst. For Nuclear Research,
Taras Shevchenko Kyiv University).....Professor
Zoubos, K., MSc(Stony Brook Univ, NY) PhD(Univ Patras,
Greece).....Professor
Duvenhage, R. deV., BSc(Hons) MSc PhD(Pretoria) .....Associate Professor
Manyala, N.I., BSc(Hons) MSc(Witwatersrand)
PhD(Louisiana State Univ).....Associate Professor
Meyer, W.E., MSc PhD(Pretoria) .....Associate Professor
Diale, M., BSc(Ed)(UNIBO) MSc(Medunsa) PhD(Pretoria).....Senior Lecturer
Krüger, T.P.J., MSc(NW Univ) PhD(Vrije Univ Amsterdam) .....Senior Lecturer
Moji, C., BSc(Hons)(University of the North) MSc PhD(Natal).....Senior Lecturer
Nel, J.M., BSc(Hons)(Port Elizabeth) MSc(Cape Town)
PhD(Pretoria) .....Senior Lecturer
Throop, H.B.MSc PhD(Astronomy Univ, Colorado(USA).....Senior Lecturer
Hlatshwayo, T.T MSc(Zululand) PhD(Pretoria).....Lecturer
Janse van Rensburg, P.J., BSc(Hons)(Pretoria) .....Lecturer
Langa, D.F. BScHons(Limpopo) MSc(Johannesburg). .....Lecturer

Legodi, M.J., BSc(Medunsa) MSc(Pretoria) ..... Lecturer
Machatine, A., MSc(Leipzig) ..... Lecturer
Odendaal, R.Q., MSc(Pretoria) ..... Lecturer
Prinsloo, L.C., MSc HED PhD(Pretoria) ..... First Technical Assistant

Department of Physiology

Van Papendorp, D.H., MBChB(Pretoria) BSc(Hons) MSc PhD(Stellenbosch) M.Akad.SA ..... Professor (Head)
Joubert, A.M., BSc MSc PhD(Pretoria) ..... Professor
Pretorius E., BSc(Hons) MSc(Stellenbosch) PhD DTI(Pretoria) ..... Professor
Apatu, R.S.K., MBChB(Ghana) PhD(Cantab) ..... Associate Professor
Ker, J., MBChB MMed(Int) PhD(Pretoria) MRCP(Edinburgh) Fellow: European Society of Cardiology ..... Associate Professor
Viljoen, M., MSc PhD(Pretoria) PhD(Witwatersrand) Nat Dip(Microbiology) ..... Emeritus Professor
Coetzee, M., BSc(DomSci)(Ed) MSc(Potchefstroom) PhD(Pretoria) ..... Senior Lecturer
Du Toit, P.J., BSc MSc PhD(Pretoria) ..... Senior Lecturer
Soma, P., MBChB(Medunsa) MSc(Pretoria) ..... Senior Lecturer
Alummoottill, S., BSc MSc(India) ..... Lecturer
Bipath, P., BSc MSc(Pretoria) ..... Lecturer
Hhlope, Y., BSc MSc(Pretoria) ..... Lecturer
Grobbelaar, C.W., MBChB(KwaZulu-Natal) MSc(Pretoria) ..... Lecturer
Koorts, A.M., BSc MSc PhD(Pretoria) ..... Lecturer
Piorkowski, T., MBChB(Pretoria) ..... Lecturer
Stander, B.A,. B.Med.Sci(Free State) MSc PhD(Pretoria) ..... Lecturer
Van Rooy, M., BSc MSc(Pretoria) ..... Lecturer
Theron, A.E., MBChB BSc(Hons) MSc(Pretoria) ..... Lecturer

Department of Plant Production and Soil Science

Annandale, J.G., MSc(Agric)(Pretoria) PhD(WSU) ..... Professor (Acting Head)
Kruger, R.A., MSc DSc(Pretoria) ..... Honorary Professor
Bristow, K.L., BSc(Hons)(Natal) MSc(Free State) PhD(WSU) ..... Extraordinary Professor
Duke, S.O., MS(Univ Arkansas) PhD(Duke Univ) ..... Extraordinary Professor
Everson, C.S., BSc(Hons) MSc PhD (KwaZulu-Natal) ..... Extraordinary Professor
Haverkort, A.J., MSc(Wageningen) PhD(Reading) ..... Extraordinary Professor
Reinhardt, C.F., BSc(Hons)(Free State) BSc(Agric)(Hons) MSc(Agric) PhD(Pretoria) ..... Extraordinary Professor
Singels, A., BSc(Agric)(Hons) MSc(Agric) PhD(Free State) ..... Extraordinary Professor
Stirzaker, R.J., MSc(Agric) PhD(Sydney) ..... Extraordinary Professor
Van Heerden, P.D.R., MSc(Stellenbosch) PhD(Potchefstroom) ..... Extraordinary Professor
Chirwa, P. W. C., BSc(Hons)(Bangor) MSc(Gainesville, Florida) PhD(Nottingham) ..... Associate Professor
Du Toit, E.S., BSc(Hons) MSc(Agric) PhD(Pretoria) ..... Associate Professor
Steyn, J.M., BSc(Hons) MSc(Agric)(Free State) PhD(Pretoria) ..... Associate Professor
Ghebremariam, T.T., MSc(Agric)(Pretoria) ..... Extraordinary Lecturer
Surridge-Talbot, A.K.J., BSc(Hons) MSc PhD(Pretoria) ..... Extraordinary Lecturer
Vahrmeijer, J.T., BSc(Hons) MSc(Potchefstroom) ..... Extraordinary Lecturer

Madakadze, I.C., BSc(Agric)(Hons)(Zimbabwe)
MSc(Reading) PhD(McGill).....Senior Lecturer
Marais, D., BSc(Agric)(Hons) MSc(Agric) PhD(Pretoria).....Senior Lecturer
Taylor, N. J., PhD(KwaZulu-Natal).....Senior Lecturer
Truter, W. F., MSc(Agric) PhD(Pretoria).....Senior Lecturer
Van der Laan, M., BSc(Hons) MSc(Agric) PhD(Pretoria).....Senior Lecturer
Vorster, B.J., MSc PhD(Pretoria).....Senior Lecturer
De Jager, P.C., BSc(Hons)(Potchefstroom) MSc(Pretoria)……..Lecturer
Tesfamariam, E.H., MSc(Agric) PhD(Pretoria).....Lecturer

Department of Plant Science
Meyer, J.J.M., PhD(Pretoria).....Professor (Head)
Smith, G.F., PhD (J.P.H.Acocks Chair).....Extraordinary Professor
Van Rooyen, M. W., PhD(Pretoria) HNED.....Extraordinary Professor
Berger, D.K., PhD(Cape Town).....Professor
Van Wyk, A.E., MSc(Potchefstroom) DSc(Pretoria) HED FLS.....Professor
Lall, N., PhD(Pretoria).....Associate Professor
Kunert, K.S., PhD (Konstanz Germany).....Senior Research Fellow
Crampton, B.G., PhD(Pretoria.....Senior Lecturer
Kritzinger, Q., PhD(Pretoria).....Senior Lecturer
Tshikalange, T.E., MSc PhD(Pretoria).....Senior Lecturer
Greve, M., MSc(Stellenbosch) PhD(Aarhus Univ, Denmark).....Senior Lecturer
Le Roux, P.C., BSc(Hons)(Pretoria) PhD(Stellenbosch).....Senior Lecturer
Bapela, M.J., MSc(Pretoria).....Lecturer
Kiviet, A.M., BSc(Hons)(Fort Hare) MSc(Michigan State Univ)
HED(Transkei) BEd (Unisa) Med(Michigan State Univ)
D. ED(Columbia, USA).....Lecturer

Postgraduate School of Agriculture and Rural Development
Machethe, C.L., BSc(Agric)(Hons)(Fort Hare)
MSc(Agric)(University of the North) M.S. PhD(Michigan).....Professor/Director

SADC Centre for Land-related, Regional and Development Law and Policy
Olivier, N.J.J., BA(Law) LLB BA(Hons)(Pretoria)
Drs Juris LLD(Leiden) MA(Pretoria)
BA(Hons)(Potchefstroom) LLD(Pretoria).....Professor/Director

SAFCOL Forest Science Chair
Chirwa, P. W. C., BSc(Hons)(Bangor) MSc(Gainesville, Florida) .....Director/
PhD(Nottingham) Associate Professor
Brink, M., BSc MBA (Stellenbosch) MFor (Oregon, USA)
PhD(Stellenbosch).....ExtraordinaryProfessor
Geldenhuys, C., BSc MSc (Stellenbosch) PhD (Cape Town).....ExtraordinaryProfessor
Käetsch, C., MSc PhD (Göttingen, Germany).....ExtraordinaryProfessor
Malan, F., BSc (Hons)MSc PhD (Stellenbosch).....ExtraordinaryProfessor

Department of Statistics

Bekker, A., MSc(Johannesburg) PhD(Unisa) ..... Associate Professor (Head)
Chakroborti, S., PhD(State University of New York) ..... Professor (SARchi chair holder)
Crafford, G., MSc PhD(Pretoria) ..... Senior Lecturer
Debusho, L.K., MSc(Addis Ababa) PhD(KwaZulu-Natal)..... Senior Lecturer
Ehlers, R., MSc PhD(Pretoria) ..... Senior Lecturer
Fletcher, L., MSc PhD(Unisa)..... Senior Lecturer
Kanfer, F.H.J., MSc PhD(Potchefstroom)..... Senior Lecturer
Louw, E.M., MSc PhD(Pretoria) ..... Senior Lecturer
Millard, S.M., MCom(Pretoria)..... Senior Lecturer
Strydom, H.F., MSc(Unisa) PhD(Pretoria)..... Senior Lecturer
Swanepoel, A., MSc(Port Elizabeth) ..... Senior Lecturer
Adamski, K., BSc(Hons) MSc(Pretoria)..... Lecturer
Basson, E.M., BSc(Hons) MSc(Pretoria)..... Lecturer
Bodenstein, L.E., BCom(Hons) MCom(Pretoria) ..... Lecturer
Coetsee, J., BCom(Hons) MCom(Pretoria) ..... Lecturer
Corbett, A.D., BCom BSc(Hons)(Pretoria)..... Lecturer
Fabris-Rotelli, I.N., MSc PhD(Pretoria)..... Lecturer
Graham, M.A., MSc PhD(Pretoria)..... Lecturer
Loots, M.T., BSc(Hons) MSc(Pretoria) ..... Lecturer
Reyneke, F., BSc(Hons) MSc(Pretoria)..... Lecturer
Van Niekerk, J., BSc(Hons) MSc(Pretoria)..... Lecturer
Van Staden, P.J., BCom(Hons) MCom(Pretoria)..... Lecturer

Wingfield M Mondi Chair

Roux, J., PhD(Free State).....Professor

Department of Zoology and Entomology

Chimimba, C.T., BSc(Malawi) MSc(Western Australia) PhD(Pretoria) FLS FZS(London) PrSciNat.……..Professor (Head)
Best, P.B., MA PhD(Cantab).....Extraordinary Professor
Cameron, E.Z., BSc MSc(Canterbury) PhD(Massey) .....Extraordinary Professor
Clutton-Brock, T.H., MA PhD ScD(Cantab).....Extraordinary Professor
Crewe, R.M., BSc(Agric) MSc(Agric)(Natal) PhD(Georgia) FRES FRSSA MSAAS PrSciNat.....Extraordinary Professor
Dippenaar-Schoeman, A.S., BSc(Unisa) BSc(Hons) MSc PhD(RAU) .....Extraordinary Professor
Faulkes, C.G, PhD (University College London).....Extraordinary Professor
Kfir, R., BSc(Agric) MSc(Agric) PhD(Hebrew University Jerusalem)..Extraordinary Professor
Mansell, M.W., BSc(Hons) PhD(Rhodes).....Extraordinary Professor
Moritz, R.F.A., Dip PhD(Frankfurt) .....Extraordinary Professor
Bastos, A., BSc(Hons) MSc PhD(Pretoria).....Professor
Bennett, N.C., BSc(Hons)(Bristol) MSc PhD(Cape Town) FZS .....Professor
Bester, M.N., BSc(Hons) MSc(Stellenbosch) DSc(Pretoria) PrSciNat .....Professor
Ferguson, J.W.H., BSc(Port Elizabeth) BSc(Hons) MSc(Pretoria) PhD(Witwatersrand).....Professor
McKechnie, A.E., MSc PhD(Natal).....Professor
Millar, R.P., MSc(London) PhD(Liverpool) RFCPath FRSE FRSSA .....Professor (Director)

Nicolson, S.W., BSc(Hons)(Auckland) PhD(Cantab) FRES.....Professor
Scholtz, C.H., BSc(Hons) MSc DSc(Pretoria) FRES .....Professor
Van Aarde, R.J., MSc DSc(Pretoria) PrSciNat .....Professor
Krüger, K., MPhil(Wales) PhD(Pretoria) FRES.....Associate Professor
Pirk, C.W.W., MSc(Berlin TU) PhD(Rhodes).....Associate Professor
Robertson, M.P., BSc BSc(Hons) PhD(Rhodes) .....Associate Professor
De Bruyn, P.J.N., BSc(Hons) MSc PhD(Pretoria).....Senior Lecturer
Garnas, J.R., BA(Colorado) MSc(Maine) PhD(Dartmouth).....Senior Lecturer
Sole, C.L., BSc(Hons) MSc PhD(Pretoria) .....Senior Lecturer
Dietemann, V., MSc(Paris) PhD(Würzburg) .....Extraordinary Lecturer
Lindsey, P.A., BA(Oxford) MSc PhD(Pretoria).....Extraordinary Lecturer
Visser, D., BScAgric(Hons)MSc(Agric)(Stellenbosch)
PhD(Pretoria).....Extraordinary Lecturer
Du Toit, C.A., BSc(Hons) PhD(Pretoria).....Lecturer
Hurley, B., BSc(Hons) MSc PhD(Pretoria) .....Lecturer
Golpalraj, J.B.P., BSc MSc(Madurai Kamaraj Univ) .....Lecturer
Weldon, C.W., BEnvSci(Hons)(Newcastle) PhD(Sydney).....Lecturer

BSc Four-year Programme
Kritzinger, Q., PhD(Pretoria) .....Senior Lecturer /Director
Fouché, I., BA(Hons)(Pretoria) MA(Pretoria).....Lecturer
Grimsley, R., BA(Hons) (Pretoria) .....Lecturer
Immelman, S., BA(Hons)(Unisa) .....Lecturer
Leso, T., BA(Hons)(Unisa) .....Lecturer
Naidoo, J., BA(Hons)(Unisa).....Lecturer
Thokwane, D., BA(Hons)(Limpopo) MA(Minnesota).....Lecturer

Student Administration
Beresford, M.E., Mrs .....Head: Student Administration

Faculty Manager
Kotze, S.l, MA PhD(Pretoria)

GENERAL INFORMATION

Admission
Any person who wishes to register at the University for the first time, or after an interruption of studies, should apply or reapply for admission. Application for admission to all undergraduate programmes closes on 30 September.

Selection
A selection procedure takes place prior to admission to the following degree programmes in the Faculty of Natural and Agricultural Sciences:

Postgraduate programmes:
BScHons in Biotechnology: Applications close on 8 November.
BScHons in Chemistry: Applications close on 15 December.
BScHons in Wildlife Management: Applications close on 30 October.
MScAgric in Animal Science (all specialisations): Applications close on 30 October.

Statement of symbols
When registering at this University for the first time, a candidate has to submit a record of symbols obtained for each subject in the Grade 12 examination.

National Senior Certificate
All undergraduate candidates who enrol at the University of Pretoria for the first time, must show their original National Senior Certificate at the Student Administration of their faculty before the end of the first semester.

Language of tuition
In conducting its general business, the University uses two official languages, namely Afrikaans and English. In formal education, the language of tuition is either Afrikaans or English, or both languages, taking the demand as well as academic and economic viability into consideration. However, it remains the student's responsibility to determine in which language a module and any further level of that module is presented. The information is published annually in the Timetable. The University reserves the right to change the language of tuition on short notice, depending on the size of the groups and the avail-ability of lecturers. In respect of administrative and other services, a student may choose whether the University should communicate with him or her in Afrikaans or English.

Bursaries and loans
Particulars of bursaries and loans are available on request.
Visit the website: www.up.ac.za/fao

Accommodation
Applications for accommodation in university residences for a particular year should be submitted as from March 1 of the preceding year. Applications will be considered as long as vacancies exist, and prospective students are advised to apply well in advance.
Please note that admission to the University does not automatically mean that lodging will also be available.

Welcoming day, registration and start of the academic year
Details of the welcoming day to which all parents are cordially invited, the subsequent programme for registration and start of the academic year during which all new first-year students **must** be present, are obtainable from the Director: Student Affairs.

Prescribed books
Lists of prescribed books are not available. The appropriate lecturers will supply information regarding prescribed books to students at the commencement of lectures.

Amendment of regulations and fees
The University retains the right to amend the regulations and to change module fees without prior notification.
Please note: The fees advertised and thus levied in respect of a module or study programme presentation represents a combination of the costs associated with the formal services rendered (for example lectures, practicals, access to laboratories, consumables used in laboratories, etc) as well as associated indirect overheads such as the provision of library and recreation facilities, security and cleaning services, electricity and water supply, etc. Therefore the fees in respect of a module or study programme presentation cannot simply be reconciled with the visible services that are rendered in respect of such module or study programme.

NB: The University of Pretoria started phasing in a new system of education and learning during 2000, which meets the requirements set out in the SAQA guidelines (South African Qualifications Authority) and in the NQF (National Qualification Framework). This entails the implementation of training programmes that will be outcomes-based and market-orientated. This system was implemented in the Faculty during 2001.

Presentation of a module or a programme
The Faculty reserves the right not to offer a particular module or programme if there is insufficient resources to do so, or if an insufficient number of qualified students present themselves.

Definition of terms

Familiarise yourself with the following terms. They are used generally in all faculties.

academic year: the duration of the academic year which is determined by the University Council
core module: a compulsory module for a specific study programme or package
module code: consists of an equal number of capitals and digits, which indicate the name of the module, the year of study, the period of study and the level of the module
credits: a number of credits are allocated to each module. These represent the quantity of work and the extent of the module
curriculum: a series of modules grouped together from different subjects over a specified period of time and in a certain sequence according to the regulations
elective module: a module that forms part of a study programme and which may be chosen by the students on condition that sufficient module credits on a specific level is obtained, as is required for the qualification for which the student is registered
examination mark: the mark a student obtains for an examination in a module, including practical and clinical examinations where applicable. If necessary, the examination mark is finalised after ancillary examinations have been completed

extended study programme: a study programme for a degree or diploma which is completed according to the regulations over a longer period than the minimum duration of the particular degree or diploma
final mark: the mark calculated on the basis of the semester/year mark and the examination mark a student obtained in a particular module according to a formula which is determined from time to time in the regulations for each module with the proviso that should no semester/year mark be required in a module, the examination mark serves as the final mark
fundamental module: a module that is regarded as the academic basis of the learning activities in a specific programme or package
grade point average based on module credits (GPA): an average mark that is calculated by multiplying the final mark achieved in a module with the credit value of that module and then dividing the sum of these values by the total of the credit values of all the modules for which a student was enrolled. The result of these calculations is a weighted average based on module credits.
GS: a combined mark (semester/year mark plus examination mark) of at least 40% required for admission to a specific prescribed module
level of a module or **year level**: the academic level of a module which is indicated in the module code: this is an indication of the complexity of a module; the year level is indicated by the first digit of the module code (thus, PHY 131 is a module in Physics at level 1)
learning hours: This refers to the notional number of hours students should spend to master the learning content of a particular module or programme. The total number of learning hours for a module consists of the time needed for lectures, practicals, self-study and any other activity required by the training programme. Learning hours for modules are calculated on the basis of 40 working hours per week x 28 weeks = 1120 + 80 additional hours for evaluation = 1200. For undergraduate modules, the total number of learning hours per module are calculated using the formula number of credits (per module) x 10.
module: a defined part of a subject deemed to be an independent learning unit to which a module code is being allocated; a module is normally offered over seven weeks (quarter module).
registration: the process a candidate is required to complete to be admitted as a student of the University or for admission to a module
regulation for admission: a regulation drawn up by the Dean of a faculty regarding the admission of students to the faculty. It includes a provision regarding the selection process
semester module: a module that extends over one semester
semester/year mark: the mark a student obtains during the course of a semester or a year for tests, class-work, practical work or any other work in a particular module as approved by regulation
subject: a demarcated field of study of which one module or more may be chosen for a study programme
syllabus: the division of the study material for a specific module, according to the regulations
year module: a module that extends over one year (two semesters)

REGULATIONS AND CURRICULA

The rules for degrees, diplomas and certificates here published are subject to change and may be amended prior to the commencement of the academic year in 2014.

1. Admission to undergraduate study

1.1. General

(a) To register for a first bachelor's degree at the University, a candidate must, in addition to the required National Senior Certificate with admission for degree purposes, comply with the specific admission requirements for particular modules and fields of study as prescribed in the admission regulations and the faculty regulations.

(b) Candidates are advised to write the Institutional Proficiency Test of the University of Pretoria.

(c) Applicants are notified in writing of provisional admission. Admission to the Faculty of Natural and Agricultural Sciences is based on the final grade 12 examination results. In the case of the BSc (Four-year programme) candidates may be considered for admission based on the final grade 12 examination results and the results of the compulsory Institutional Proficiency Test .

(d) The following persons may also be considered for admission:
   (i) A candidate who is in possession of a certificate that is deemed by the University to be equivalent to the required National Senior Certificate with admission for degree purposes.
   (ii) A candidate who is a graduate from another tertiary institution or has been granted the status of a graduate of such an institution.
   (iii) A candidate who passes an entrance examination, as prescribed by the University from time to time.

   Abovementioned candidates are requested to contact the Student Administration at the faculty for more information regarding admission requirements.

   Note: A conditional exemption certificate does not grant admission to bachelor's study. However, in certain circumstances some of the faculties do accept a conditional exemption on the basis of mature age. Candidates are advised to contact the specific faculty administration in this regard.

(e) The Senate may limit the number of students allowed to register for a module, in which case the Dean concerned may, at his own discretion, select from the students who qualify for admission those who may be admitted.

(f) Subject to faculty regulations and the stipulations of General Regulations G.1.3 and G.62, a candidate will only be admitted to postgraduate bachelor's degree studies, if he or she is already in possession of a recognised bachelor's degree.

(g) **Admission requirements for the Faculty of Natural and Agricultural Sciences for candidates with a National Senior Certificate:**

   To be able to gain access to the Faculty and specific programmes prospective students require the appropriate combinations of recognised NSC subjects as well as certain levels of achievement in the said subjects. In this regard the determination of an admission point score (APS) is explained and a summary of the specific requirements, ie the APS and the specific subjects required is provided.

Determination of an Admission Point Score (APS)
The calculation is simple and based on a candidate's achievement in six 20-credit recognised subjects by using the NSC ratings, that is the "1 to 7 scale of achievement". Thus, the highest APS that can be achieved is 42.

Life Orientation is excluded from the calculation determining the APS required for admission per faculty.

Rating code	Rating	Marks %
7	Outstanding achievement	80-100%
6	Meritorious achievement	70-79%
5	Substantial achievement	60-69%
4	Adequate achievement	50-59%
3	Moderate achievement	40-49%
2	Elementary achievement	30-39%
1	Not achieved	0-29%

Preliminary admission is based on the results obtained in the final Grade 11 examination. Final admission is based on Grade 12 results.
Please note: The final Grade 12 results will be the determining factor with regard to admission.

Alternative admission channels:
Candidates with an APS lower than required, could be considered for admission to the faculty if they meet the additional assessment criteria specified by the faculty from time to time. Preference will, however, be given to students who comply with the regular admission requirements of the faculty.

Specific requirements for the Faculty of Natural and Agricultural Sciences
1. A valid National Senior Certificate with admission for degree purposes.
2. It is recommended that all applicants write the UP Institutional Proficiency Test
3. The following minimum subject and level requirements:

<table>
<tr><td rowspan="2">Degree</td><td rowspan="2">APS</td><td colspan="2">Group A</td><td>Group B</td></tr>
<tr><td>Two languages</td><td>Mathematics</td><td>Physical Science</td></tr>
<tr><td rowspan="2">BSc in Biological Sciences (All the degrees including Medical Sciences)</td><td>30</td><td>Comply with NSC minimum requirements; ADDITIONALLY one of these languages must be Afrikaans OR English at level 4(50-59%).</td><td>5 (60%-69%)
or
4 (50-59%)
provided a 5 symbol is obtained for Physical Science</td><td>5 (60%-69%)
or
4 (50-59%)
provided a 5 symbol is obtained for Mathematics</td></tr>
<tr><td colspan="4">There are only 72 places available in the first year of BSc (Medical Sciences). Students who apply for Medical Sciences as their first choice before 30 September will be admitted until the places have been filled. Students who indicate it as their second choice will be placed on a waiting list and will be considered in January of the first year of study, if places become available.
Students who do not comply with these entrance requirements and who wrote the Institutional Proficiency Test may be considered for the BSc (Four-year programme) by the Admissions Committee.</td></tr>
</table>

Degree	APS	Group A		Group B
		Two languages	Mathematics	Physical Science
BSc in Physical Sciences (Geography, Geology, Environment and Engineering Geology, Meteorology, Environmental Science, Chemistry, Physics, Geoinformatics)	30	Comply with NSC minimum requirements; ADDITIONALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	5 (60-69%)	5 (60-69%)
	Students who do not comply with these entrance requirements and who wrote the Institutional Proficiency Test may be considered for the BSc (Four-year programme).			

Degree	APS	Group A		Group B
		Two languages	Mathematics	Physical Science
BSc in Food Science and Nutrition Duration 4 years BSc Food Management BSc Nutrition with 2 options Nutritional Science Community Health Duration 3 years BSc Food Science	30	Comply with NSC minimum requirements; ADDITIONALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	5 (60%-69%) or 4 (50-59%) provided a 5 symbol is obtained for Physical Science	5 (60%-69%) or 4 (50-59%) provided a 5 symbol is obtained for Mathematics
	Students who do not comply with the entrance requirements and who wrote the Institutional Proficiency Test may be considered for the BSc (Four-year programme). Please note: Students who are placed on the BSc (Four-year programme) will take a minimum of five years to complete the programmes BSc in Food Management or the options in BSc in Nutrition. Please note: BSc in Nutrition: This four-year programme will provide some specialisation in the third and fourth years of study by means of two options. Students following the Public Health Nutrition option will be able to register as natural scientists with SACNAP and will be able to continue with a research-based MSc in Nutrition. The proposed programme will replace the existing programme in Nutrition and Food Science. Students who wish to be selected to be admitted to the third year of Public Health Nutrition will have to apply at the Client Service Centre during the second year of registration with a closing date of 30 July of the preceding year. Only students who have passed all first- and second-year prescribed and elective modules will be considered for election.			

Degree	APS	Group A	
		Two languages	Mathematics
BConsumer Science	26	Comply with NSC minimum require-ments; ADDITION-ALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	4 (50-59%)

Degree	APS	Group A	
		Two languages	Mathematics
BSc in Mathematical Sciences (Applied Mathematics, Mathematics, Mathematical Statistics)	32	Comply with NSC minimum require-ments; ADDITION-ALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	6 (70-79%)
	Students who do not comply with these entrance requirements and who wrote the Institutional Proficiency Test may be considered for the BSc: (Four-year programme) by the Admissions Committee.		
BSc in Mathematical Sciences (Actuarial and Financial Mathematics)	34	Comply with NSC minimum require-ments; ADDITION-ALLY one of these languages must be Afrikaans OR English at level 5 (60-69%).	7 (80-100%)
	BSc (Actuarial and Financial Mathematics): Admissions from the BSc (Four-year programme) to the BSc (Actuarial and Financial Mathematics) study programme will be considered if students have passed all their first-year modules with an average mark of at least 60% and a minimum mark of 60% for WTW 143 and WTW 153.		

Degree	APS	Group A		Group B
		Two languages	Mathematics	Physical Science
BScAgric	30	Comply with NSC minimum require-ments; ADDITION-ALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	5 (60%-69%) or 4 (50-59%) provided a 5 symbol is obtained for Physical Science	5 (60%-69%) or 4 (50-59%) provided a 5 symbol is obtained for Mathematics
	Students who do not comply with these entrance requirements and who wrote the Institutional Proficiency Test may be considered for the BSc(Four-year programme) with a view to apply to transfer to BSc(Agric) programmes after successful completion of the BSc (Four-year programme).			

Degree	APS	Group A		Group B
		Two languages	Mathematics	Physical Science
BSc (Four-year programme) (Biological and Agricultural Sciences) Institutional Proficiency Test compulsory	22	Comply with NSC minimum require-ments; ADDITION-ALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	4 (50-59%) or 3 (40-49%) provided a 4 symbol is obtained for Physical Science	4 (50-59%) or 3 (40-49%) provided a 4 symbol is obtained for Mathematics
BSc (Four-year programme) (Physical Sciences) Institutional Proficiency Test compulsory	22	Comply with NSC minimum requirements; ADDITIONALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	4 (50-59%) or 3 (40-49%) provided a 4 symbol is obtained for Physical Science	4 (50-59%) or 3 (40-49%) provided a 4 symbol is obtained for Mathematics

Degree	APS	Group A	
		Two Languages	Mathematics
BSc (Four-year programme) (Mathematical Sciences) Institutional Proficiency Test compulsory	26	Comply with NSC minimum requirements; ADDITIONALLY one of these languages must be Afrikaans OR English at level 4 (50-59%).	5 (60-69%)

1.2. Requirements for specific modules

A candidate who:

(a) passed the Grade 12 examination in Mathematics with at least 60% will be admitted to the modules GLY 155, 161 and 162 in Geology;

(b) passed the Grade 12 examination in Mathematics with at least 50%, will be admitted to WTW 134, WTW 115 and WTW 152 and 60% for WTW114, WTW126, WTW 158 and WTW 161 in Mathematics, and to WST 111 in Mathematical Statistics (For the degree programme in Actuarial and Financial Mathematics, 80% in Mathematics is required);

(c) passed the Grade 12 examination in Mathematics as well as in Physical Science with at least 50%, will be admitted to Molecular and Cell Biology and a module in the subjects Zoology and Entomology, Genetics, Microbiology or Plant Science;

(d) passed the Grade 12 examination in Mathematics with at least 50%, or obtained at least 50% in STK 113 and 123 will be admitted to BME 120;

(e) passed the Grade 12 examination in Mathematics and Physical Science with at least 50%, will be admitted to the module CMY 117, 127 and 151 in Chemistry and PHY 131 and with at least 60% for PHY 114 and PHY 124.
(f) obtained at least 4 (50-59%) in Mathematics, and has passed WTW 133 and WTW 143, will be admitted to Informatics 153, 154, 163, 164;
(g) obtained at least 60% in Grade 12 Mathematics will be admitted for STK110. Candidates who do not qualify for STK 110, must enrol for STK 113 and STK 123.
(h) The modules Mathematical Statistics (WST) and Statistics (STK), except for STK 281, may not be taken simultaneously in a programme.

Please note:
- '*The Grade 12 examination*' refers to the final National Senior Certificate examination.
- A student who takes a module presented by another faculty must take note of the admission requirements of that module, subminimum required in examination papers, supplementary examinations, etc.

2. Registration for a particular year of study

At the beginning of an academic year, a student registers for all the modules he or she intends taking in that particular year (whether these be first-semester, second-semester or year modules). Changes to the chosen field of study may be made at the beginning of the second semester/third quarter with the Dean's approval. A student may also only register for modules that will fit in on the lecture, test and examination timetables. Should a student be prepared to attend one module after hours to avoid clashes on the timetables, the approval of the Dean is not required. (This will only be possible if the module in question is offered full-time and extramurally). A student is allowed to register for the next year of study only if at least the equivalent of four semester modules have been passed in a particular year of study.

3. Leave of absence

If it is impossible for a registered student at the University of Pretoria to continue with his/her studies/research in a specific year, but he/she intends to continue in the following year, the student must apply in writing to the dean of the relevant faculty for **leave of absence**. The application must include: full names, student number, address, reasons and period for leave of absence, for example the whole year, first semester (January to June) or second semester (July to December), name of supervisor (where applicable), and the student's intentions for the period after his/her leave of absence. However, in accordance with the policy of the University of Pretoria, leave of absence is not granted for more than two years. Any outstanding fees should be paid in full upon the student's return from his/her leave of absence.

4. Extended programmes:

BSc (Four-year programme) – Mathematical Sciences (02130007)
BSc (Four-year programme) – Biological and Agricultural Sciences (02130008)
BSc (Four-year programme) – Physical Sciences (02130010)

(a) These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
(b) 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.

(c) 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.
(d) 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).
(e) Students who are admitted to one of the BSc four-year programmes register for one specific programme.

5. Module credits for unregistered students

There are students who attend lectures, write tests and examinations and in this manner earn "marks", but have either not registered for modules or even as students at all. These marks will not be communicated to any student before he/she has provided proof of registration. A student cannot obtain any credits in a specific academic year for a module "passed" in this manner during a previous academic year and for which he/she was not registered. This arrangement applies even where the student is prepared to pay the tuition fees.

6. 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.

6.1. 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.

6.2. 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.

6.3. 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.

6.4. Re-marking of examination papers (also consult Reg G.14)

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.

6.5. 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 Reg.G.12).

7. Academic information management (AIM 101 or AIM 111 and AIM 121)

It is a requirement for all new first-year students to register for the Academic information management modules.

DEGREES AND DIPLOMAS CONFERRED/AWARDED IN THE FACULTY

The following degrees and diplomas are presented in the Faculty (minimum period of study is given in brackets):

Bachelor's degrees:
Bachelor of Science – [BSc] (3 years)
Bachelor of Agricultural Science – [BScAgric] (4 years)
Bachelor of Consumer Science – [BConsumer Science] (4 years)

Honours degrees: (1 year)
Bachelor of Science Honours – [BScHons]
Bachelor of Agricultural Management Honours – [BAgrarHons]

Master's degrees: (minimum 1 year)
Master of Science – [MSc]
Master of Agricultural Science – [MScAgric]
Master of Agricultural Management – [MAgrar]
Master of Consumer Science – [MConsumer Science] (minimum 2 year)

Doctoral degrees:
Doctor of Philosophy – [PhD] (minimum 1 year)
Doctor of Science – [DSc]

Diploma:
Advanced University Diploma in Extension and Rural Development – (1 year)

BACHELOR'S DEGREES

GENERAL INFORMATION FOR DEGREES IN THE FACULTY

General Regulations G.1 to G.15 are applicable to a bachelor's degree.

Sc.1 Duration
BSc
The minimum duration of study is three years full-time study.

BScAgric, BConsumer Science, BSc in Food Management
The minimum duration of study is four years full-time study.

Sc.2 Study programmes
The curricula are compiled from the study programmes in Sc. 7 or an alternative study programme as approved by the Dean.

Sc.3 Compilation of the curriculum
BSc
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 as set out in

regulation Sc.6.1. 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 in Sc.6.1 a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the 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 Head of Department, approve deviations in this regard. Subject to the programmes as indicated in Sc.6.1, 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.

BSc in Medical Sciences
As from 2004 the BScMedSci degree is presented in this Faculty.

NB: Due to the limited facilities, only 72 students can be admitted. Only candidates who have applied for admission by 30 September and who indicated this programme as a first choice, are provisionally admitted pending Grade 12 final results.

Promotion requirements:
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 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 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.

BScAgric
The minimum total of credits needed to comply with degree requirements is set out at the end of each study programme.
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 head of department, approve deviations from the prescribed curriculum.

Promotion requirements:
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 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 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.

BConsumer Science

Promotion requirements:

All the degrees in Consumer Science

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.

BSc (Four-year programme)

Three extended programmes are available:
BSc (Four-year programme) – Mathematical Sciences (02130007),
BSc (Four-year programme) – Biological and Agricultural Sciences (02130008) and BSc (Four-year programme) – Physical Sciences (02130010).
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 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.

Applications for admission to the BSc (Four-year programme) must be submitted annually before 30 September. All students considered for the BSc (Four-year programme) must have written an Institutional Proficiency Test . Information in this regard is available at the Client Services Centre. In addition all rules and regulations applicable to the normal study programmes, apply *mutatis mutandis* to the BSc (Four-year programme), with exceptions stated in the regulations for 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.

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.

Curriculum
The following available modules as indicated below, are prescribed modules for a BSc (Four-year programme) and the equivalence to the first-year modules of the normal BSc programme:

BSc (Four-year programme) – Mathematical Sciences		**02130007**

First year, first semester:		
Code	**Name**	**Crdt**
AIM 111	**Academic information management 111**	**4**
COS 133	**Introduction to programming 133**	**8**
LST 133	**Language, life and study skills 133**	**8**
WST 133	**Mathematical statistics 133**	**8**
WTW 133	**Precalculus 133**	**8**
Total credits for compulsory modules		**36**

An elective can be chosen from the modules FRK 133, CMY 133, PHY 133 or MLB 133
Compulsory credits = (36) Elective credits = (8) Total credits = (44)

First year, second semester:		
Code	**Name**	**Crdt**
AIM 121	**Academic information management 121**	**4**
COS 143	**Introduction to programming 2 143**	**8**
LST 143	**Language, life and study skills 143**	**8**
WST 143	**Mathematical statistics 143**	**8**
WTW 143	**Calculus 143**	**8**
Total credits for compulsory modules		**36**
An elective can be chosen from the modules FRK 143, CMY 143, PHY 143 or MLB 143 based on the elective chosen from the first semester		
Compulsory credits = (36) Elective credits = (8) Total credits = (44)		
Compulsory credits = (72) Elective credits = (16) Total credits = (88)		

Second year, first semester:		
Code	**Name**	**Crdt**
COS 153	**Introduction to programming 3**	**8**
WST 153	**Mathematical statistics 153**	**8**
WTW 153	**Calculus 153**	**8**

With regard to the rest of the third-semester modules(second year, first semester) and the second-semester, prescribed modules must be selected from the normal BSc programme of your choice.

BSc (Four-year programme) – Biological and Agricultural Sciences		**02130008**

First year, first semester:		
Code	**Name**	**Crdt**
AIM 111	**Academic information management 111**	**4**
CMY 133	**Chemistry 133**	**8**
LST 133	**Language, life and study skills 133**	**8**
MLB 133	**Molecular and cell biology 133**	**8**
PHY 133	**Physics 133**	**8**
WTW 133	**Precalculus 133**	**8**
Total credits for compulsory modules		**44**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 121	**Academic information management 121**	**4**
CMY 143	**Chemistry 143**	**8**
LST 143	**Language, life and study skills 143**	**8**
MLB 143	**Molecular and cell biology 143**	**8**
PHY 144	**Physics 144**	**8**
WTW 144	**Mathematics 144**	**8**
Total credits for compulsory modules		**44**
Compulsory credits = (88) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
CMY 154	**Chemistry 154**	**8**
MLB 153	**Molecular and cell biology 153**	**8**
PHY 154	**Physics 154**	**8**
WTW 154	**Mathematics 154**	**8**
Total credits for compulsory modules		**32**
Compulsory credits = (88) Elective credits = (0)		
With regard to the rest of the third semester modules(second year, first semester) and the second semester, prescribed modules must be selected from the normal BSc programme of your choice.		

BSc (Four-year programme) – Physical Sciences	WTW	02130010

First year, first semester:		
Code	**Name**	**Crdt**
AIM 111	**Academic information management 111**	**4**
CMY 133	**Chemistry 133**	**8**
LST 133	**Language, life and study skills 133**	**8**
PHY 133	**Physics 133**	**8**
WTW 133	**Precalculus 133**	**8**
Total credits for compulsory modules		**36**

An elective can be chosen from modules COS 133, or MLB 133, or WST 133
Compulsory credits = (36) Elective credits = (8) Total credits = (44)

First year, second semester:		
Code	**Name**	**Crdt**
AIM 121	**Academic information management 121**	**4**
CMY 143	**Chemistry 143**	**8**
LST 143	**Language, life and study skills 143**	**8**
PHY 143	**Physics 143**	**8**
WTW 143	**Calculus 143**	**8**
Total credits for compulsory modules		**36**
An elective module can be chosen from modules COS 143, MLB 143 or WST 143 based on the elective chosen from the first semester		
Compulsory credits = (36) Elective credits = (8) Total credits = (44)		
Compulsory credits = (72) Elective credits = (16) Total credits = (88)		

Second year, first semester:		
Code	**Name**	**Crdt**
CMY 154	**Chemistry 154**	**8**
PHY 153	**Physis 153**	**8**
WTW 153	**Calculus 153**	**8**
With regard to the rest of the third-semester modules(second year, first semester) and the second-semester, prescribed modules must be selected from the normal BSc programme of your choice.		

Prescribed: CMY 133 Chemistry 133, CMY 143 Chemistry 143 and CMY 154 Chemistry 154: Equivalent module – a BSc First-semester prescribed module: CMY 117.
Physics modules
For students in biological study directions: PHY 133 Physics 133, PHY 144 Physics 144 and PHY 154 Physics 154 Equivalent module: PHY 131.
For students who want to study Physical Sciences and engineering: PHY 133 Physics 133, PHY 143 Physics 143, PHY 153 Physics 153 Equivalent module: FSK 116 (or FSK 176)
For all other students: PHY 133 Physics 133, PHY 143 Physics 143, PHY 153 Physics 153, PHY 163 General physics: Equivalent modules: PHY 114 and PHY 124.
Prescribed: WTW 133 Precalculus 133, WTW 143 Calculus 143 and WTW 153 Calculus 153: Equivalent module – a BSc First-semester prescribed module: WTW 114.
For students in biological study directions: WTW 133 Precalculus 133, WTW 144 Mathematics 144 and WTW 154 Mathematics 154: Equivalent module WTW 134 Mathematics 134
Prescribed: MLB 133 Molecular and cell biology 133, MLB 143 Molecular and cell biology, MLB 153 Molecular and cell biology 153: Equivalent module – a BSc First-semester prescribed module: MLB 111 Molecular and cell biology 111.

NB! Students may register for an extended module (eg PHY 133, PHY 143, PHY 153 and PHY 163) only once.

Compulsory modules:
AIM 111 and AIM 121 Academic information management, 4 + 4 credits.
LST 133 and LST 143 Academic literacy, 8+ 8 credits.

All new students must register for the academic literacy modules LST.

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 Senior Appeals Committee.
- Any decision taken by the Senior Appeals Committee is final.

Specific
BSc (Four-year programme):
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.
By the end of year 1 semester 2, a student must have passed at least 4 of the 5 prescribed semester 2 modules. The final mark in the module failed must not be lower than 40% allowing the student to write a special exam in this subject early in the following year. This exam must be passed in order to register for the second year of the programme.

Sc.4 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.

Sc.5 Degree with distinction
BSc
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.

BSc (Food Management)
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

BScAgric
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.

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

- **Clothing: Clothing Retail Management:**
  A combination equivalent to six semester modules
  Marketing research 314 and Strategic marketing 321
  Clothingretail management 410 and Clothing merchandising420
  Clothing production 32, Product development 411
  Project: Clothing textile project 402
  New developments, sustainability and textile use 411
  Textiles: marketing and consumer aspects 421

- **Food Management: Food Retail Management:**
  A combinationequivalent to six semester modules:
  Marketing research 314 and Strategic marketing321
  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

- **Hospitality Management:**
  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

Sc.5.1 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%.

Sc.6 DEGREE PROGRAMMES

The curriculum is composed of one of the following study programmes. The Dean may, on the recommendation of the programme manager, approve deviations in this regard.

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

Please note: 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 list of modules on page 122.

Field of study	Dept	Code
BSc in Actuarial and Financial Mathematics	**WTW**	**02133388**

First year, first semester:		
Code	**Name**	**Crdt**
COS 132	**Imperative programming 132**	**16**
EKN 113	**Economics 113**	**15**
LST 110	**Language and study skills 110**	**6**
FBS 112	**Financial management 112**	**10**
WST 111	**Mathematical statistics 111**	**16**
WTW 114	**Calculus 114**	**16**
Total credits for compulsory modules		**79**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101 ***	**6**
EKN 123	**Economics 123**	**15**
FBS 122	**Financial management 122**	**10**
WST 121	**Mathematical statistics 121**	**16**
WTW 123	**Numerical analysis 123**	**8**
WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
Total credits for compulsory modules		**71**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (150) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
IAS 211	**Actuarial mathematics 211**	**12**
INF 214	**Informatics 214**	**14**
WST 211	**Mathematical statistics 211**	**24**
WTW 211	**Linear algebra 211**	**12**
WTW 218	**Calculus 218**	**12**
Total credits for compulsory modules		**74**

Second year, second semester:		
Code	**Name**	**Crdt**
IAS 221	Actuarial mathematics 221	12
WST 221	Mathematical statistics 221	24
WTW 220	Analysis 220	12
WTW 221	Linear algebra 221	12
WTW 264	Differential equations 264	12
Total credits for compulsory modules		**72**
Elective module : IAS 282. (Only for non-degree purposes)		
Compulsory credits = (146) Elective credits = (0)		

Third year, first semester:		
Code	**Name**	**Crdt**
WST 311	Multivariate analysis 311	18
WTW 310	Analysis 310	18
WTW 354	Financial engineering 354	18
Total credits for compulsory modules		**54**

Third year, second semester:		
Code	**Name**	**Crdt**
WST 321	Time series analysis 321	18
WTW 364	Financial engineering 364	18
Total credits for compulsory modules		**36**

Elective modules: IAS 361, IAS 382, WST 312, WST 322, WTW 320, WTW 382, WTW 383, WTW 386. All 72 elective credits must be on 3rd year level.
Compulsory credits = (90) Elective credits = (72) Total credits = (162)
A minimum of (458) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Applied Mathematics	**WTW**	**02133252**

First year, first semester:		
Code	**Name**	**Crdt**
LST 110	Language and study skills 110	6
WST 111	Mathematical statistics 111	16
WTW 114	Calculus 114	16

WTW 115	**Discrete structures 115**	**8**
WTW 152	**Mathematical modelling 152**	**8**
Total credits for compulsory modules		**54**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
WST 121	**Mathematical statistics 121**	**16**
WTW 123	**Numerical analysis 123**	**8**
WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
WTW 162	**Dynamical processes 162**	**8**
Total credits for compulsory modules		**54**
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (108) Elective credits = (32) Total credits = (140)		

Second year, first semester:		
Code	**Name**	**Crdt**
WTW 211	**Linear algebra 211**	**12**
WTW 218	**Calculus 218**	**12**
WTW 286	**Differential equations 286**	**12**
Total credits for compulsory modules		**36**

Second year, second semester:		
Code	**Name**	**Crdt**
WTW 220	**Analysis 220**	**12**
WTW 221	**Linear algebra 221**	**12**
WTW 248	**Vector analysis 248**	**12**
WTW 285	**Discrete structures 285**	**12**
Total credits for compulsory modules		**48**
Compulsory credits = (84) Elective credits = (60) Total credits = (144)		

Third year, first semester:		
Code	**Name**	**Crdt**
WTW 310	**Analysis 310**	**18**
WTW 382	**Dynamical systems 382**	**18**
WTW 386	**Partial differential equations 386**	**18**
Total credits for compulsory modules		**54**

Third year, second semester:		
Code	**Name**	**Crdt**
WTW 383	**Numerical analysis 383**	**18**
WTW 387	**Continuum mechanics 387**	**18**
Total credits for compulsory modules		**36**

Elective credits : A minimum of 54 elective credits at 100- to 300-level can be chosen from any WTW and WST modules. The remainder of the electives at 100- to 300-level can be chosen from any other modules in the list of modules of this faculty.
Compulsory credits = (90) Elective credits = (54) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Biochemistry	**BCM**	**03133001**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
CMY 282	**Physical chemistry 282**	**12**
CMY 284	**Organic chemistry 284**	**12**
GTS 251	**Molecular genetics 251**	**12**
Total credits for compulsory modules		**60**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemical principles of nutrition and toxicology 262**	**12**
CMY 283	**Anatical chemistry 283**	**12**
CMY 285	**Inorganic chemistry 285**	**12**
GTS 261	**Generic variation and evolution 261**	**12**
Total credits for compulsory modules		**60**
Students interested in combining **Biochemistry** in a dual major with **Microbiology** should take MBY 251 and MBY 261 and have to replace CMY 285 with PLG262. Students interested in combining **Biochemistry** in a dual major with **Genetics** should elect MBY 251 and MBY 261. Students interested in combining **Biochemistry** in a dual major with **Human Physiology** should replace [CMY 282 + CMY 284] with [FLG 211 + FLG 212] and [CMY 283 + CMY 285] with [FLG 221 + FLG 222] as core modules and elect MBY 251 and MBY 261. Students interested in combining **Biochemistry** in a dual major with **Plant Science** should elect BOT 251 and BOT 261.		
Compulsory credits = (120) Elective credits = (24) Total credits = (144)		

Third year, first semester:		
Code	**Name**	**Crdt**
BCM 356	**Macromolecules of life: Structure function and Bioinformatics 356**	**18**
BCM 357	**Biocatalysis and integration of metabolism 357**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
BCM 367	**Cell structure and function 367**	**18**
BCM 368	**Molecular basis of disease 368**	**18**
Total credits for compulsory modules		**36**

Students interested in combining **Biochemistry** in a dual major with **Chemistry** should elect CMY 383, CMY 385, CMY 382 and CMY 384. Students interested in combining **Biochemistry** in a dual major with **Microbiology** should elect MBY 351, MBY 355, MBY 364 and MBY 365. Students interested in combining **Biochemistry** in a dual major with **Genetics** should elect GTS 351, GTS 354, GTS 367 and either GTS 368 or BTC 361. Students interested in combining **Biochemistry** in a dual major with **Human Physiology** should elect FLG 330, FLG 327, FLG 331 and FLG 332. Students interested in combining **Biochemistry** in a dual major with **Plant Science** should elect BOT 356, BOT 358, BOT 365 and BOT 366.
Compulsory credits = (72) Elective credits = (72) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Biological Sciences	**ADM**	**03130001**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101**	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Students intending to apply for the 65 MBChB, or the 5 BChD places that become available in the second semester, may only enrol for FIL155(6), MGW112(6) and MTL180(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 WTW134 in the first semester, however ,should they not be selected and want to continue with a BSc programme, WTW134 must be taken in the second semester of the first year. • Students should take note of the prerequisites for FLG211 and FLG212.
Compulsory credits = (140) Elective credits = (0)

Field of study	Dept	Code
BSc in Biotechnology	**GTS**	**03133052**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Totals for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
Total credits for compulsory modules		**60**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
Total credits for compulsory modules		**48**

Electives may be chosen from BCM 262, BME 210, DAF 200, FST 250, GKD 250, MBY 262, PLG 251, PLG 262, PPK 251 or [ZEN 251 and ZEN 261] or other module/s subject to TDH. Please note:

- Students interested in continuing with Biochemistry at postgraduate level must take BCM 262
- Students interested in continuing with Microbiology at postgraduate level must take PLG 262

Compulsory credits = (108) Elective credits = (36) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
BCM356	**Macromolecules of life 356**	**18**
GTS 351	**Eukaryotic gene control and development 351**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
MBY 364	**Genetic manipulation of microbes 364**	**18**
Total credits for compulsory modules		**18**

Contact the Department of Genetics for information regarding elective modules.

Compulsory credits = (54) Elective credits = (90) Total credits = (144)

A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Chemistry	CMY	02133172

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
PHY 114	First course in physics 114	16
WTW 114	Calculus 114	16
Total credits for compulsory modules		54

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
CMY 127	General chemistry 127	16
PHY 124	First course in physics 124	16
WTW 126	Linear algebra 126	8
WTW 128	Calculus 128	8
Total credits for compulsory modules		54
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (108) Elective credits = (32) Total credits = (140)		

Second year, first semester:		
Code	**Name**	**Crdt**
CMY 282	Physical chemistry 282	12
CMY 284	Organic chemistry 284	12
Total credits for compulsory modules		24

Second year, second semester:		
Code	**Name**	**Crdt**
CMY 283	Analytical chemistry 283	12
CMY 285	Inorganic chemistry 285	12
Total credits for compulsory modules		24

Electives can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Geology, Zoology and Entomology, Physics, Plant Science, Computer Science, Mathematics and Applied Mathematics.
Compulsory credits = (48) Elective credits = (96) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
CMY 383	Analytical chemistry 383	18
CMY 385	Inorganic chemistry 385	18
Total credits for compulsory modules		36

Third year, second semester:		
Code	**Name**	**Crdt**
CMY 382	Physical chemistry 382	18
CMY 384	Organic chemistry 384	18
Total credits for compulsory modules		36
Compulsory credits = (72) Elective credits = (72) Total credits = (144)		
A minimum of (428) credits is required to obtain the degree.		

Field of study	Dept	Code
BSc in Ecology	ZEN	03133031

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16
BOT 161	Plant biology 161	8
CMY 127	General chemistry 127	16
GTS 161	Introductory genetics 161	8
MBY 161	Introduction to microbiology 161	8
ZEN 161	Animal diversity 161	8
Total credits for compulsory modules		70
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	Introduction to proteins and enzymes 251	12
BOT 251	South African flora and vegetation 251	12
GKD 250	Introductory soil science 250	12
GTS 251	Molecular genetics 251	12
MBY 251	Bacteriology 251	12
ZEN 251	Invertebrate biology 251	12
Total credits for compulsory modules		72

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	Plant physiology and biotechnology 261	12
GLY 161	Historical geology 161	8
GLY 162	Environmental geology 162	8
GTS 261	Genetic variation and evolution 261	12
MBY 261	Mycology 261	12
ZEN 261	African vertebrates 261	12
Total credits for compulsory modules		64
Compulsory credits = (136) Elective credits = (10) Total credits = (146)		

Third year, first semester:		
Code	**Name**	**Crdt**
BOT 356	Plant ecophysiology 356	18
BOT 358	Plant ecology 358	18
ZEN 351	Population ecology 351	18
ZEN 353	Community ecology 353	18
Total credits for compulsory modules		72

Third year, second semester:		
Code	**Name**	**Crdt**
BOT 366	Plant diversity 366	18
ZEN 361	Ecophysiology 361	18
ZEN 362	Evolution and phylogeny 362	18
ZEN 364	Conservation ecology 364	18
Total credits for compulsory modules		72
Compulsory credits = (144) Elective credits = (0)		
A minimum of (430) credits is required to obtain the degree.		

Field of study	Dept	Code
BSc in Entomology	**ZEN**	**03133041**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GLY 161	**Historical geology 161**	**8**

GLY 162	**Environmental geology 162**	**8**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**64**

Compulsory credits = (136) Elective credits = (12) Total credits = (148)

Third year, first semester:		
Code	**Name**	**Crdt**
ZEN 351	**Population ecology 351**	**18**
ZEN 353	**Community ecology 353**	**18**
ZEN 354	**Physiology 354**	**18**
ZEN 355	**Insect diversity 355**	**18**
Total credits for compulsory modules		**72**

Third year, second semester:		
Code	**Name**	**Crdt**
ZEN 361	**Ecophysiology 361**	**18**
ZEN 362	**Evolution and phylogeny 362**	**18**
ZEN 364	**Conservation ecology 364**	**18**
ZEN 365	**Applied entomology 365**	**18**
Total credits for compulsory modules		**72**

Compulsory credits = (144) Elective credits = (0)

A minimum of (432) credits is required to obtain the degree.

Field of study	**Dept**	**Code**
BSc in Environmental and Engineering Geology	**GLY**	**02133042**

First year, first semester:		
Degree programmes in the Department of Geology: Students will be informed timeously of compulsory excursions that could take place during the vacations. The attendance of excursions for first-year students is compulsory, while excursions of longer duration are compulsory for senior students.		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
GLY 155	**Introduction to geology 155**	**16**

LST 110	**Language and study skills 110**	**6**
PHY 114	**First course in physics 114**	**16**
WTW 158	**Calculus 158**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
CMY 127	**General chemistry 127**	**16**
GLY 161	**Historical geology 161**	**8**
GLY 162	**Environmental and hazard geology 162**	**8**
SWK 122	**Mechanics 122**	**16**
WTW 168	**Calculus 168**	**8**
Total credits for compulsory modules		**62**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (132) Elective credits = (8) Total credits = (140)

Second year, first semester:		
Code	**Name**	**Crdt**
GKD 250	**Introductory soil science 250**	**12**
GLY 254	**Structural geology 254**	**12**
GLY 255	**Fundamental and applied mineralogy 255**	**24**
SWK 210	**Strength of materials 210**	**16**
Total credits for compulsory modules		**64**

Second year, second semester:		
Code	**Name**	**Crdt**
GLY 253	**Sedimentology 253**	**12**
GLY 261	**Igneous petrology 261**	**12**
GLY 262	**Metamorphic petrology 262**	**12**
GLY 265	**Groundwater 265**	**12**
Total credits for compulsory modules		**48**
Compulsory credits = (112) Elective credits = (36) Total credits = 148		

Third year, first semester:		
Code	**Name**	**Crdt**
GKD 350	**Soil classification and surveying 350**	**14**
GLY 361	**Ore deposits 361**	**18**

GLY 362	**Geostatistics and ore reserve calculations 362**	**18**
SGM 311	**Soil mechanics 311**	**16**
	Total credits for compulsory modules	**66**

Third year, second semester:		
Code	**Name**	**Crdt**
GKD 320	**Soil chemistry 320**	**14**
GLY 363	**Engineering geology 363**	**18**
GLY 364	**Rock mechanics 364**	**18**
	Total credits for compulsory modules	**50**

Electives for the first to third year can be chosen from the following departments: Geography, Geoinformatics and Meteorology, Plant Production and Soil Science, Chemistry, Mathematics and Applied Mathematics and Physics.
Compulsory credits = (116) Elective credits = (28) Total credits = (144)
A minimum of (432) credits is required to obtain the degree.

Field of study	**Dept**	**Code**
BSc in Environmental Sciences	**GGY**	**02133361**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
ENV 101	**Introduction to environmental sciences 101**	**8**
GGY 156	**Aspects of human geograhy 156**	**8**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
WTW 114	**Calculus 114**	**16**
	Total credits for compulsory modules	**70**
Students can take WTW 134 instead of WTW 114 if they meet the entry requirement.		

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**

GGY 166	**Southern African geomorphology 166**	**8**
WKD 164	**Climate and weather of Southern Africa 164**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Electives can be chosen from the following departments: Geography, Geoinformatics and Meteorology, Geology, Plant Production and Soil Science, Physics, Chemistry, Plant Science , Mathematics and Applied Mathematics, Zoology and Entomology, Anthropology and Archaeology and Computer Science.
Compulsory credits = (140) Elective credits = (6) Total credits = (146)

Second year, first semester:		
Code	**Name**	**Crdt**
BOT 251	**South African flora and vegetation 251**	**12**
GGY 252	**Process geomorphology 252**	**12**
GGY 283	**Introductory GIS 283**	**12**
GKD 250	**Introductory soil science 250**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**60**

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	**Plant physiology and biotechnology 261**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**24**
Electives can be chosen from the following departments: Geography, Geoinformatics and Meteorology, Physics, Geology, Plant Production and Soil Science, Chemistry, Plant Science , Mathematics and Applied Mathematics, Zoology and Entomology, Anthropology and Archaeology and Computer Science.		
Compulsory credits = (84) Elective credits = (60) Total credits = (144)		

Third year, first semester:		
Code	**Name**	**Crdt**
ENV 301	**Human environmental interactions 301**	**18**
GIS 310	**Geographic information systems 310**	**24**
Total credits for compulsory modules		**42**

Third year, second semester:		
Code	**Name**	**Crdt**
GGY 361	**Environmental geomorphology 361**	**18**
GIS 320	**Spatial analysis 320**	**24**
Total credits for compulsory modules		**42**

Electives can be chosen from modules in the departments: Geography, Geoinformatics and Meteorology, Geology, Plant Production and Soil Science, Physics, Chemistry, Plant Science , Mathematics and Applied Mathematics, Zoology and Entomology, Anthropology and Archaeology and Computer Science
Compulsory credits = (84) Elective credits = (60) Total credits = (144)
A minimum of (434) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Food Management	**VBR**	**02133384**

First year, first semester:		
Code	**Name**	**Crdt**
BEM 110	**Marketing management 110**	**10**
CMY 117	**General chemistry 117**	**16**
FSG 110	**Physiology 110**	**6**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
VDS 111	**Basic food preparation 111**	**6**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**76**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
CMY 127	**General chemistry 127**	**16**
FSG 120	**Physiology 120**	**6**
MBY 161	**Introduction to microbiology 161**	**8**
VDS 121	**Basic food preparation 121**	**6**
Total credits for compulsory modules		**58**
***** Students may enrol for AIM111 and AIM121 instead of AIM101 (the same content presented over 2 semesters)		
Compulsory credits = (134) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	Introduction to proteins and enzymes 251	12
BCM 252	Carbohydrate metabolism 252	12
BEM 212	Consumer behaviour 212	16
MBY 251	Bacteriology 251	12
VDS 210	Food commodities and preparation 210	18
	Total credits for compulsory modules	70

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	Lipid and nitrogen metabolism 261	12
BCM 262	Biochemistry in perspective 262	12
FST 260	Principles of food processing and preservation 260	12
MBY 262	Food microbiology 262	12
VDS 221	Food commodities and preparation 221	18
	Total credits for compulsory modules	66
	Compulsory credits = (136) Elective credits = (0)	

Third year, first semester:		
Code	**Name**	**Crdt**
FST 351	Food chemistry (1) 351	18
FST 352	Food chemistry (2) 352	18
VDG 311	Nutrition 311	17
VDS 310	Consumer food research 310	21
	Total credits for compulsory modules	74

Third year, second semester:		
Code	**Name**	**Crdt**
VDB 321	Food service management 321	18
VDG 321	Nutrition during life cycle 321	17
VDS 322	Large-scale food production and restaurant management 322	31
	Total credits for compulsory modules	66

Compulsory credits = (140) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
FST 412	Sensory analysis 412	10
FST 414	Research methodology 414	8

OPI 400	**Experiential training in industry 400***	**5**
VDS 413	**Recipe development and standardisation 413**	**30**
VDS 417	**Consumer aspects of foods 417**	**15**
VNP 480	**Food research project 480**	**14**
Total credits for compulsory modules		**82**

Elective modules FST 413 (30) may be substituted with VDS 414 (28)

FST 413	**Product development and quality management 413**	**30**
VDS 414	**Culinary art 414**	**28**

Fourth year, second semester:		
Code	**Name**	**Crdt**
OPI 400	**Experiential training in industry 400***	**5**
VDB 420	**Food service management 420**	**21**
VNP 480	**Food research project 480**	**14**
Total credits for compulsory modules		**40**
Elective module VDS427 may be substituted with VDS424		
VDS 424	**Culinary art 424**	**19**
VDS 427	**Food retail and visual merchandising 427**	**17**
Total credits for compulsory elective modules		**57/59**

*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” 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.

Compulsory credits = (122) Elective credits = (47/56) =169/178

A minimum of (578/587) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Food Science	VDW	03134011

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16
BOT 161	Plant biology 161	8
CMY 127	General chemistry 127	16
GTS 161	Introductory genetics 161	8
MBY 161	Introduction to microbiology 161	8
ZEN 161	Animal diversity 161	8
Total credits for compulsory modules		70

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

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	Introduction to proteins and enzymes 251	12
BCM 252	Carbohydrate metabolism 252	12
FST 250	Introduction to food science and technology 250	12
GTS 251	Molecular genetics 251	12
MBY 251	Bacteriology 251	12
VDG 250	Nutrition 250	12
Total credits for compulsory modules		72

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	Lipid and nitrogen metabolism 261	12

BCM 262	Biochemistry in perspective 262	12
FST 260	Principles of food processing and preservation 260	12
GTS 261	Genetic variation and evolution 261	12
MBY 261	Mycology 261	12
MBY 262	Food microbiology 262	12
Total credits for compulsory modules		72

Compulsory credits = (140) Elective credits = (0)

Third year, first semester:		
Code	Name	Crdt
FST 350	Integrated food science 350	18
FST 351	Food chemistry (1) 351	18
FST 352	Food chemistry (2) 352	18
FST 353	Food engineering 353	18
Total credits for compulsory modules		72

Third year, second semester:		
Code	Name	Crdt
FST 360	Principles of the science and technology of plant foods 360	18
FST 361	Animal food science 361	18
FST 362	Advanced animal and plant foods microbiology 362	18
VVW 364	Food composition and applied nutritional programmes 364	18
Total credits for compulsory modules		72

Compulsory credits = (144) Elective credits = (0)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Genetics	GTS	03133051

First year, first semester:		
Code	Name	Crdt
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**60**

- Electives may be chosen from: BCM 262, GGY 283, PLG 262, MBY 262
- Students interested in combining Genetics in a dual major with **Microbiology** must take PLG 262.
- Students interested in combining Genetics in a dual major with **Biochemistry** must take BCM 262 and may replace [BOT 251 + BOT 261] and [ZEN 251 + ZEN 261] with [CMY 282 + CMY 284 + CMY 283 + CMY 285].

Compulsory credits = (132) Elective credits = (12) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
GTS 351	**Eukaryotic gene control and development 351**	**18**
GTS 354	**Genome evolution and phylogenetics 354**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
BTC 361	**Plant genetics and crop biotechnology 361**	**18**
GTS 367	**Population and evolutionary genetics 367**	**18**
GTS 368	**Genetics in human health 368**	**18**
Total credits for compulsory modules		**54**

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.

Dual major track

- Genetics and **Biochemistry** combination:
  Students must replace BTC 361 with Biochemistry modules and must take [BCM 356 + BCM 357] and [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] and [MBY 364 + MBY 365] to a total value of 72 credits.

- Genetics and **Plant Science** combination:
  Students must take [BOT 356 + BOT 358] and [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 [any 2 modules of ZEN 351 or ZEN 352 or ZEN 353 or ZEN 354] and [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 355 + ZEN 351 or ZEN 353 or ZEN 354] and [ZEN 361 + ZEN 365] to a total value of 72 credits.

Compulsory credits = (90) Elective credits = (54) Total credits = (144)

A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Geography	**GGY**	**02133385**

First year, first semester:		
Code	**Name**	**Crdt**
ENV 101	**Introduction to environmental sciences 101**	**8**
GGY 156	**Aspects of human geography 156**	**8**
GMC 110	**Cartography 110**	**12**
LST 110	**Language and study skills 110**	**6**
WTW 114	**Calculus 114**	**16**
Total credits for compulsory modules		**50**
Students can take WTW 134 instead of WTW 114 if they meet the entry requirement.		

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
GGY 166	**Southern African geomorphology 166**	**8**
WKD 164	**Climate and weather of Southern Africa 164**	**8**
Total credits for compulsory modules		**22**
***** Students may enrol for AIM111 and AIM121 instead of AIM101 (the same content presented over 2 semesters)		

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.
Compulsory credits = (72) Elective credits = (68) Total credits = (140)

Second year, first semester:		
Code	**Name**	**Crdt**
GGY 252	**Process geomorphology 252**	**12**
GGY 283	**Introductory GIS 283**	**12**
Total credits for compulsory modules		**24**

Second year, second semester:		
Code	**Name**	**Crdt**
GGY 266	**City structures, environment and society 266**	**24**
GIS 220	**Geographic data analysis 220**	**12**
Total credits for compulsory modules		**36**

Electives can be chosen from modules in the following departments: Geography, Geo-informatics 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.
Compulsory credits = (60) Elective credits = (84) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
ENV 301	**Human environmental interactions 301**	**18**
GGY 356	**Sustainable development 356**	**18**
GIS 310	**Geographic information systems 310**	**24**
Total credits for compulsory modules		**60**

Third year, second semester:		
Code	**Name**	**Crdt**
GGY 361	**Environmental geomorphology 361**	**18**
GGY 366	**Development frameworks 366**	**18**
GIS 320	**Spatial analysis 320**	**24**
Total credits for compulsory modules		**60**

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.
Compulsory credits = (120) Elective credits = (24) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	**Dept**	**Code**
BSc in Geoinformatics	**GGY**	**02133383**

First year, first semester:		
Code	**Name**	**Crdt**
ENV 101	**Introduction to environmental sciences 101**	**8**
GGY 156	**Aspects of human geography 156**	**8**
GMC 110	**Cartography 110**	**12**
INF 112	**Informatics 112**	**10**

INF 154	**Informatics 154**	**10**
INF 171	**Informatics 171**	**10**
LST 110	**Language and study skills 110**	**6**
WTW 114	**Calculus 114**	**16**
Total credits for compulsory modules		**80**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
GGY 166	**Southern African geomorphology 166**	**8**
GIS 120	**Geoinformatics 120**	**12**
INF 164	**Informatics 164**	**10**
INF 171	**Informatics 171**	**10**
WKD 164	**Climate and weather of Southern Africa 164**	**8**
WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (150) Elective credits = (0) Total credits = (150)

Second year, first semester:		
Code	**Name**	**Crdt**
BER 210	**Business law 210**	**16**
GGY 283	**Introductory GIS 283**	**12**
GMA 220	**Remote sensing 220**	**16**
INF 214	**Informatics 214**	**14**
STK 110	**Statistics 110**	**13**
Total credits for compulsory modules		**71**
Students who do not qualify for STK 110 must register for STK 113 and STK 123		

Second year, second semester:		
Code	**Name**	**Crdt**
GIS 220	**Geographic data analysis 220**	**12**
INF 225	**Informatics 225**	**14**
INF 261	**Informatics 261**	**7**
STK 120	**Statistics 120**	**13**
SUR 220	**Surveying 220**	**16**
Total credits for compulsory modules		**62**

Compulsory credits = (133) Elective credits = (13) Total credits = (146)

Third year, first semester:		
Code	**Name**	**Crdt**
GIS 310	Geographic information systems 310	24
GMC 310	Geometrical and space geodesy 310	24
OBS 114	Business management 114	10
Total credits for compulsory modules		58

Third year, second semester:		
Code	**Name**	**Crdt**
GIS 320	Spatial analysis 320	24
GMA 320	Remote sensing 320	24
GMT 320	Geoinformatics project 320	24
OBS 124	Business management 124	10
Total credits for compulsory modules		82
Compulsory credits = (140) Elective credits = (22) Total credits = (162)		
A minimum of (458) credits is required to obtain the degree.		

Field of study	Dept	Code
BSc in Geology	GLY	02133022

First year, first semester:		
Degree programmes in the Department of Geology: Students will be informed timeously of compulsory excursions that could take place during the vacations. The attendance of excursions for first-year students is compulsory, while excursions of longer duration are compulsory for senior students.		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
GLY 155	Introduction to geology 155	16
LST 110	Language and study skills 110	6
PHY 114	First course in physics 114	16
WTW 114	Calculus 114	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
CMY 127	General chemistry 127	16
GLY 161	Historical geology 161	8

GLY 162	**Environmental and hazard geology 162**	**8**
WTW 128	**Calculus 128**	**8**
	Total credits for compulsory modules	**46**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Electives can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Plant Production and Soil Science, Chemistry, Mathematics and Applied Mathematics, Physics and Computer Science.		
Compulsory credits = (116) Elective credits = (24) Total credits = (140)		

Second year, first semester:		
Code	**Name**	**Crdt**
GKD 250	**Introductory soil science 250**	**12**
GLY 254	**Structural geology 254**	**12**
GLY 255	**Fundamental and applied mineralogy 255**	**24**
	Total credits for compulsory modules	**48**

Second year, second semester:		
Code	**Name**	**Crdt**
GLY 253	**Sedimentology 253**	**12**
GLY 261	**Igneous petrology 261**	**12**
GLY 262	**Metamorphic petrology 262**	**12**
GLY 265	**Groundwater 265**	**12**
	Total credits for compulsory modules	**48**

Electives can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Plant Production and Soil Science, Chemistry, Mathematics and Applied Mathematics and Physics.
Compulsory credits = (96) Elective credits = (48) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
GLY 361	**Ore deposits 361**	**18**
GLY 362	**Geostatistics and ore reserve calculations 362**	**18**
	Total credits for compulsory modules	**36**

Third year, second semester:		
Code	**Name**	**Crdt**
GLY 363	**Engineering geology 363**	**18**
GLY364	**Rock mechanics 364**	**18**
	Total credits for compulsory modules	**36**

Electives can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Plant Production and Soil Science, Chemistry, Mathematics and Applied Mathematics and Physics.
Compulsory credits = (72) Elective credits = (72) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Human Genetics	**GTS**	**03134031**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
FLG 211	**Introductory and neurophysiology 211**	**12**

FLG 212	**Circulatory physiology 212**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
FLG 221	**Lung and renal physiology, acid-base balance and temperature 221**	**12**
FLG 222	**Digestion, endocrinology and reproductive systems 222**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
Total credits for compulsory modules		**72**

Compulsory credits = (144) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
GTS 351	**Eukaryotic gene control and development 351**	**18**
GTS 354	**Genome evolution and phylogenetics 354**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
GTS 367	**Population and evolutionary genetics 367**	**18**
GTS 368	**Genetics in human health 368**	**18**
Total credits for compulsory modules		**36**

Single major track:
Electives may be chosen from any combination of: BCM 356, BCM 357, BCM 367, BCM 368, BOT 365, BTC 361, FAR 381, FAR 382, MBY 351, MBY 355, MBY 364 and MBY 365.

Dual major track

- Genetics and **Physiology** combination:
  Students must take [FLG 330 + FLG 327 + FLG 331 + FLG 332] to a total value of 72 credits.

Compulsory credits = (72) Elective credits = (72) Total credits = (144)

A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Human Physiology	**FLG**	**03134021**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

Students intending to apply for the 65 MBChB, or the 5 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 from doing WTW 134 in the first semester, however should they not be selected and want to continue with BSc, WTW 134 must be taken in the second semester of the first year.
- Students should take note of the prerequisites for FLG 211 and FLG 212. Students who, after the first year, do not comply with the prerequisites for these modules, will be required to apply to Student Administration, Faculty of Natural and Agricultural Sciences, to remain in the study programme.

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**

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

- Students who did not take WTW 134 in the first semester are reminded to enrol for it in the second semester.
- Students should take note of the prerequisites for FLG 211 and FLG 212. Students who after the first year do not comply with the prerequisites for these modules, will be required to apply to Student Administration, Faculty of Natural and Agricultural Sciences to remain in the study programme.

Compulsory credits = (140) Elective credits = (0) Total credits = (140)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
FLG 211	**Introductory and neurophysiology 211**	**12**
FLG 212	**Circulatory physiology 212**	**12**
GTS 251	**Molecular genetics 251**	**12**
Total credits for compulsory modules		**60**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
FLG 221	**Lung and renal physiology, acid-base balance and temperature 221**	**12**
FLG 222	**Digestion, endocrinology and reproductive systems 222**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
Total credits for compulsory modules		**60**

Electives can be chosen from Chemistry 283 and 284 (in consultation with the Head of the Department), Microbiology, Plant Science or Zoology.
Compulsory credits = (120) Elective credits = (24) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
FLG 327	**Higher neurological functions 327**	**18**
FLG 330	**Cellular and developmental physiology 330**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
FLG 322	**Industrial physiology 322***	**18**
FLG 331	**Exercise and nutrition science 331**	**18**
FLG 332	**Applied and pathophysiology 332**	**18**
Total credits for compulsory modules		**54**

Electives may be chosen from Biochemistry, Chemistry (in consultation with Head of Department), Genetics, Microbiology, Plant science, Zoology or the combination of Pharmacology and Genetics/Biochemistry.
*NOTE: Only students interested in pursuing postgraduate studies in occupational health and safety must take FLG 322 Industrial physiology. The balance of their elective credits must be chosen from the options below.

Electives may be chosen from 300-level modules in Biochemistry or Genetics or a combination of Pharmacology and Genetics/Biochemistry. Electives may also be chosen from 300-level modules in Chemistry (in consultation with Head of Department), Microbiology, Plant science or Zoology, if the necessary prerequisite modules were completed at 200-level.
Compulsory credits = (90) Elective credits = (54) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Human Physiology, Genetics and Psychology	**FLG**	**02133392**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
SLK 110	**Psychology 110**	**12**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**82**

Students intending to apply for the 65 MBChB, or the 5 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 BSc, WTW134 must be taken in the second semester of the first year.
- Students should take note of the prerequisites for FLG 211 and FLG 212. Students who, after the first year do not comply with the prerequisites for these modules, will be required to apply to Student Administration, Faculty of Natural and Agricultural Sciences, to remain in the study programme.

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**

SLK 120	**Psychology 120**	**12**
Total credits for compulsory modules		**58**

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

- Students should take note of the prerequisites for FLG 211 and FLG 212. Students who after the first year do not comply with the prerequisites for these modules, will be required to apply to Student Administration, Faculty of Natural and Agricultural Sciences, to remain in the study programme.
- Students who intend to apply for the BSocSciHons (Psychology) programme must complete the following research modules: RES 210 and RES 320.

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:

Code	Name	Crdt
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
FLG 211	**Introductory and neurophysiology 211**	**12**
FLG 212	**Circulatory physiology 212**	**12**
GTS 251	**Molecular genetics 251**	**12**
SLK 210	**Psychology 210**	**20**
Total credits for compulsory modules		**80**

Students that do not comply with the prerequisites for the modules FLG 211 and FLG 212, will be required to apply to Student Administration at the Faculty to remain in the study programme.

Second year, second semester:

Code	Name	Crdt
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
FLG 221	**Lung and renal physiology, acid-base balance and temperature 221**	**12**
FLG 222	**Digestion, endocrinology and reproductive systems 222**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
SLK 220	**Psychology 220**	**20**
Total credits for compulsory modules		**80**

- Students intending to apply for the BSocSciHons (Psychology) programme must complete the following research modules: RES 210 and RES 320.

Compulsory credits = (160) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
FLG 327	**Higher neurological functions 327**	**18**
GTS 351	**Eukaryotic gene control and development 351**	**18**
GTS 354	**Genome evolution and phylogenetics 354**	**18**
SLK 310	**Psychology 310**	**30**
Total credits for compulsory modules		**84**

Third year, second semester:		
Code	**Name**	**Crdt**
FLG 331	**Exercise and nutrition sciences 331**	**18**
FLG 332	**Applied and pathophysiology 332**	**18**
GTS 368	**Genetics in human health 368**	**18**
SLK 320	**Psychology 320**	**30**
Total credits for compulsory modules		**84**

- Students intending to apply for the BSocSciHons (Psychology) programme must complete the following research modules: RES 210 and RES 320.
- Students intending to apply for BScHons (Genetics) must also complete the module GTS 367 in their third year.

Compulsory credits = (168) Elective credits = (0)

A minimum of (468) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Mathematical Statistics	**WST**	**02133273**

First year, first semester:		
Code	**Name**	**Crdt**
LST 110	**Language and study skills 110**	**6**
WST 111	**Mathematical statistics 111**	**16**
WTW 114	**Calculus 114**	**16**
Total credits for compulsory modules		**38**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
WST 121	**Mathematical statistics 121**	**16**

WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
	Total credits for compulsory modules	**38**

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

It is recommended that COS 132 be taken as a first-year elective by all students in this programme. Additional electives should be chosen as follows:
Students in Mathematical Statistics who also want to be trained for the Mathematics industry normally choose from WTW 123 (8), 115 (8), 152 (8), 162 (8) and COS 110 (16)

Students in Mathematical Statistics who also want to be trained for the Insurance industry, Econometrics, normally choose:
EKN 113, 123 (30
FBS 110, 120 (20) or FBS 112, 122 (20)
COS 110 (16)

Students in Mathematical Statistics with other career requirements, choose modules from any other subject/faculty to meet their specific needs.

Compulsory credits = (76) Elective credits = (64) Total credits = (146)

Second year, first semester:		
Code	**Name**	**Crdt**
WST 211	**Mathematical statistics 211**	**24**
WTW 211	**Linear algebra 211**	**12**
WTW 218	**Calculus 218**	**12**
	Total credits for compulsory modules	**48**

Second year, second semester:		
Code	**Name**	**Crdt**
WST 221	**Mathematical statistics 221**	**24**
WTW 220	**Analysis 220**	**12**
WTW 221	**Linear algebra 221**	**12**
	Total credits for compulsory modules	**48**

Students in Mathematical Statistics who also want to be trained for the Mathematics industry normally choose from WTW 264 (12) or WTW 286 (12), 285 (12).

Students in Mathematical Statistics who also want to be trained for the Insurance Industry normally choose IAS 221 (12), IAS 282 (12) (note the prerequisite specified by the Department of Insurance and Actuarial Science).

Students in Mathematical Statistics who also want to be trained for the Econometrics industry normally choose from: EKN 214(16), 224 (16) and STK 281 (10).

Students in Mathematical Statistics with other career requirements, choose modules from any other subject/faculty to meet their specific needs.
Compulsory credits = (96) Elective credits = (48) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
WST 311	**Multivariate analysis**	**18**
WST 312	**Stochastic processes 312**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
WST321	**Time series analysis 321**	**18**
WST 322	**Actuarial statistics 322**	**18**
Total credits for compulsory modules		**36**
Students in Mathematical Statistics who also want to be trained for the Mathematics industry normally choose from: WTW 310 (18), 320 (18), 354 (18), 364 (18), 381 (18), 382 (18), 383 (18), 385 (18), 386 (18), 387 (18), 389 (18). Students in Mathematical Statistics who also want to be trained for the Insurance industry normally choose IAS 382 (20). Students in Mathematical Statistics who also want to be trained for the Econometrics industry normally choose from: EKN 310, 320 and 314 (60). Students in Mathematical Statistics with other career requirements, choose modules from any other subject/faculty to meet their specific needs.		
Compulsory credits = (72) Elective credits = (72) Total credits = (144)		
A minimum of (428) credits is required to obtain the degree.		

Field of study	**Dept**	**Code**
BSc in Mathematics	**WTW**	**02133262**

First year, first semester:		
Code	**Name**	**Crdt**
LST 110	**Language and study skills 110**	**6**
WST 111	**Mathematical statistics 111**	**16**
WTW 114	**Calculus 114**	**16**
WTW 115	**Discrete structures 115**	**8**
WTW 152	**Mathematical modelling 152**	**8**
Total credits for compulsory modules		**54**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
WST 121	**Mathematical statistics 121**	**16**
WTW 123	**Numerical analysis 123**	**8**
WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
WTW 162	**Dynamical processes 162**	**8**
Total credits for compulsory modules		**54**

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

Compulsory credits = (108) Elective credits = (32) Total credits = (140)

Second year, first semester:		
Code	**Name**	**Crdt**
WTW 211	**Linear algebra 211**	**12**
WTW 218	**Calculus 218**	**12**
WTW 286	**Differential equations 286**	**12**
Total credits for compulsory modules		**36**

Second year, second semester:		
Code	**Name**	**Crdt**
WTW 220	**Analysis 220**	**12**
WTW 221	**Linear algebra 221**	**12**
WTW 248	**Vector analysis 248**	**12**
WTW 285	**Discrete structures 285**	**12**
Total credits for compulsory modules		**48**

Compulsory credits = (84) Elective credits = (60) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
WTW 310	**Analysis 310**	**18**
WTW 381	**Algebra 381**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
WTW 320	**Analysis 320**	**18**
WTW 389	**Geometry 389**	**18**
Total credits for compulsory modules		**36**

A minimum of 54 elective credits at 100- to 300-level can be chosen from any WTW and WST modules. The remainder of the electives at 100-to 300-level can be chosen from any other modules in the list of modules of this faculty.
Compulsory credits = (72) Elective credits = (72) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Medical Sciences	**ANA**	**03134020**

Students who have not passed all the first-year, first-semester modules in BScMedSci are excluded from continuing with BScMedSci in the second semester and need to deregister and reregister for another BSc programme, eg BSc in Biological Sciences (or a completely different degree programme).

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
FIL 155	**Science and world views 155**	**6**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**76**

Students intending to apply for the 65 MBChB, or the 5 BChD places, that become available in the second semester, may only enrol for MGW112(6) and MTL180(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 WTW134 in the first semester, however, should they not be selected and want to continue with BSc, WTW134 must be taken in the second semester of the first year.
- Students should take note of the prerequisites for FLG211 and FLG212. Students who, after the first year do not comply with the prerequisites for these modules, will be required to apply to Student Administration, Faculty of Natural and Agricultural Sciences, to remain in the study programme.

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
ANA 121	**Introduction: Human anatomy and embriology 121**	**4**

ANA 122	**Human osteology 122**	**4**
ANA 126	**Basic human histology 126**	**4**
BME 120	**Biometry 120**	**16**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
Total credits for compulsory modules		**66**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (142) Elective credits = (0)

ANA modules can only be taken by BSc (Human Physiology) and BSc (Medical Science) students in the first year.
ANA modules can only be taken by BSc (Medical Science) students in the second and third years.

Second year, first semester:		
Code	**Name**	**Crdt**
ANA 214	**Human cell and developmental biology 214**	**12**
ANA 215	**Paleoantropology 215**	**12**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
Total credits for compulsory modules		**48**
Elective credits ANA + FLG option: FLG 211 (12) and FLG 212 (12) ANA + GTS option: GTS 251 (12) and MBY 251 (12) ANA + FLG/FAR option: Same as FLG option		

Second year, second semester:		
Code	**Name**	**Crdt**
ANA 226	**Human histology 226**	**12**
ANA 247	**Human anatomy part 1 247**	**12**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
Total credits for compulsory modules		**48**
Elective credits ANA + FLG option: FLG 221 (12) and FLG 222 (12) ANA + GTS option: GTS 261 (12) and MBY 261 (12) ANA + FLG/FAR option: Same as FLG option		
Compulsory credits = 96 Elective credits: FLG option: 48 credits, GTS option: 48 credits, FAR option: Same as FLG option		

Third year, first semester:		
Code	**Name**	**Crdt**
ANA 315	**Forensic antropology 315**	**18**
ANA 316	**Cell and tissue techniques 316**	**18**
Total credits for compulsory modules		**36**

Elective credits
ANA + FLG option: FLG 330 (18) and FLG 327 (18)
ANA+ GTS option: GTS 351 (18) and GTS 354 (18).
ANA+ FLG/FAR option: FLG 330 (18) and FAR 381(18)

Third year, second semester:		
Code	**Name**	**Crdt**
ANA 324	**Applied human cell and developmental biology 324**	**18**
ANA 347	**Human anatomy Part 2 347**	**18**
Total credits for compulsory modules		**36**

*FAR 383 must be taken by students who choose FAR 384
Elective credits:
ANA + FLG option: FLG 331 (18) and FLG 332 (18)
ANA + GTS option: GTS 367 (18) and GTS 368 (18).
ANA + FLG/FAR option: FLG 331 (18) or FLG 332 (18) and FAR 382 (18)

Compulsory credits = 72
Elective credits: FLG option: 72 credits, GTS option: 72 credits, FLG/ FAR option: 71 credits

A minimum of 430 credits for the ANA + FLG option is required to obtain the degree.
A minimum of 430 credits for the ANA +GTS option is required to obtain the degree.
A minimum of 430 credits for the ANA + FLG/FAR option is required to obtain the degree.

Field of study	Dept	Code
BSc in Meteorology	**GGY**	**02133312**

First year, first semester:		
Code	**Name**	**Crdt**
LST 110	**Language and study skills 110**	**6**
PHY 114	**First course in physics 114**	**16**
WKD 155	**Atmospheric structure and processes 155**	**16**
WTW 114	**Calculus 114**	**16**
Total credits for compulsory modules		**54**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
PHY 124	**First course in physics 124**	**16**
WKD 164	**Climate and weather of Southern Africa 164**	**8**
WTW 126	**Linear algebra 126**	**8**
WTW 128	**Calculus 128**	**8**
Total credits for compulsory modules		**46**
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (100) Elective credits = (42) Total credits = (142)

Second year, first semester:		
Code	**Name**	**Crdt**
GMA 220	**Remote sensing 220**	**16**
WKD 261	**Physical meteorology 261**	**14**
WTW 218	**Calculus 218**	**12**
Total credits for compulsory modules		**42**

Second year, second semester:		
Code	**Name**	**Crdt**
GIS 220	**Geographic data analysis 220**	**12**
WKD 263	**Introduction to dynamical meteorology 263**	**14**
WTW 248	**Vector analysis 248**	**12**
Total credits for compulsory modules		**38**
Compulsory credits = (80) Elective credits = (68) Total credits = (148)		
Third year, first semester:		
Code	**Name**	**Crdt**
WKD 352	**Atmospheric vorticity and divergence 352**	**18**
WKD 356	**Climate and community 356**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
WKD 361	**Quasi-geostrophic analysis 361**	**20**
WKD 366	**Fundamentals of weather forecasting 366**	**36**
Total credits for compulsory modules		**56**

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.
Compulsory credits = (92) Elective credits = (52) Total credits = (144)
A minimum of (434) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Microbiology	**MBY**	**03133071**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**

BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**72**

Applied Microbiology option: ZEN 251 may be replaced with FST 250
Medical Microbiology option: Students should replace ZEN 251 and BOT 251 with FLG 211 and FLG 212
Microbiology and Biochemistry combination: Students should replace ZEN 251 and BOT 251 with CMY 282 and CMY 284

Second year, second semester:

Code	Name	Crdt
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BOT 261	**Plant biochemical evolution 261**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
PLG 262	**Principles in plant pathology 262**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**72**

Applied Microbiology option: Students may replace ZEN 261and/or BOT 261 with either MBY 262 or
FST 260 or BCM 262
Medical Microbiology option: Students should replace ZEN 261 and BOT 261 with FLG 221 and FLG 222
Microbiology and Genetics combination: Students may replace ZEN 261 with MBY 262
Microbiology and Plant Science option: Students may replace ZEN 261 with MBY 262
Microbiology and Biochemistry combination: Students should replace ZEN 261 and BOT 261 with CMY 283 and BCM 262

Compulsory credits = (144) Elective credits = (0)

Third year, first semester:

Code	Name	Crdt
MBY 351	**Virology 351**	**18**
MBY 355	**Bacterial genetics 355**	**18**
Total credits for compulsory modules		**36**

Applied Microbiology option:
Two electives may be selected from BCM 356, BCM 357, BOT 356, BOT 358, GTS 351, GTS 354, PLG 351or ZEN 355.
Students can only take a module if they comply with all the prerequisites.
Medical Microbiology option:
Two electives may be selected from BCM 356, BCM 357, GTS 351 or GTS 354
Microbiology and Genetics combination:
Students take GTS 351 and GTS 354

Microbiology and Plant Science combination:
Students take BOT 356 and BOT 358
Microbiology and Biochemistry combination:
Students take BCM 356 and BCM 357

Third year, second semester:		
Code	**Name**	**Crdt**
MBY 364	**Genetic manipulation of microbes 364**	**18**
MBY 365	**Micobe interactions 365**	**18**
Total credits for compulsory modules		**36**

Applied Microbiology option:
Two electives may be selected from BMC 367, BCM 368, BOT 365, BTC 361, FST 362, GTS 367 or ZEN 365.
Students can only take a module if they comply with all the prerequisites
Medical Microbiology option:
Two electives may be selected from BCM 367, BCM 368, GTS 367 or GTS 368
Microbiology and Genetics combination:
Students take GTS 367 and either GTS 368 or BTC 361
Microbiology and Plant Science combination:
Students take BOT 365 and BTC 361
Microbiology and Biochemistry combination:
Students take BCM 367 and BCM 368

Compulsory credits = (72) Elective credits = (72) Total credits = (144)

A minimum of (428) credits is required to obtain the degree.

Field of study	**Dept**	**Code**
BSc in Nutrition	**VDW**	**03134013**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
FSG 110	**Physiology 110**	**6**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
VDS 111	**Basic food preparation 111**	**6**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**82**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
CMY 127	**General chemistry 127**	**16**
FSG 120	**Physiology 120**	**6**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
VDS 121	**Basic food preparation 121**	**6**
Total credits for compulsory modules		**66**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (148) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
FLG 211	**Introductory and neurophysiology 211**	**12**
FLG 212	**Circulatory physiology 212**	**12**
HNT 210	**Human nutrition 210**	**27**
Total credits for compulsory modules		**75**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
FLG 221	**Lung and renal physiology, acid-base balance and temperature 221**	**12**
FLG 222	**Digestion, endocrinology and reproductive systems 222**	**12**
FST 260	**Principles of food processing and preservation 260**	**12**
HNT 220	**Human nutrition 220**	**24**
Total credits for compulsory modules		**84**
Compulsory credits = (159) Elective credits = (0)		

Third year, first semester:		
Code	**Name**	**Crdt**
FST 355	**Chemistry of macro- and micro-nutrients 355**	**18**
RCH 310	**Research project 310**	**20**

MRZ 310	**Ethics and human rights in healthcare 320**	**6**
NTA 313	**Nutritional assessment 313**	**46**

Public Health Nutrition option: Additional core modules

CNT 310	**Community nutrition 310**	**12**

Nutritional Science option: Additional core modules

BCM 356	**Macromolecules of life: Structure function and Bioinformatics 356**	**18**
Compulsory modules Public Health Nutrition option = (102)		
Compulsory modules Nutritional Science option = (108)		

Third year, second semester:		
Code	**Name**	**Crdt**
RCH 320	**Research project 320**	**10**
VVW 364	**Food composition and applied nutritional programmes 364**	**18**
VDS 354	**Food safety and hygiene 354**	**12**
FNH 320	**Food and nutrition security 320**	**8**
Total credits for compulsory modules		**48**

Public Health Nutrition option: Additional core modules

BCM 368	**Molecular basis of diseases 368**	**18**
CNT 320	**Community nutrition 320**	**3**
DTT 222	**Nutrition education 222**	**18**

Nutritional Science option: Additional core modules

BCM 368	**Molecular basis of diseases 368**	**18**
Compulsory modules Public Health Nutrition option		**87**
Compulsory modules Nutritional Science option		**66**
Total compulsory modules Public Health Nutrition option = (189)		
Total compulsory modules Nutritional Science option = (174)		

Fourth year, first semester: Public Health Nutrition Option		
Code	**Name**	**Crdt**
HNT 411	**Advanced human nutrition 411**	**18**
RCH 410	**Research project 410**	**7**
CNT 411	**Community nutrition 410**	**25**
VDS 417	**Consumer aspects of food 417**	**15**
Total credits for compulsory modules		**58**

Fourth year, second semester: Public Health Nutrition Option		
Code	**Name**	**Crdt**
FNH 421	International nutrition 421	20
FNH 480	Internship training in public health nutrition 480	60
Total credits for compulsory modules		60
Total compulsory modules Public Health Nutrition option = (138)		

Fourth year, first semester: Nutritional Science Option		
Code	**Name**	**Crdt**
BME 210	Biometry 210	24
HNT 411	Advanced human nutrition 411	18
FST 400	Research metholdology and seminar 400	20
FNH 400	Research project 400	20
Total credits for compulsory modules		82

Fourth year, second semester: Nutritional Science Option		
Code	**Name**	**Crdt**
FNH 420	Advanced food, nutrition and health 420	20
FNH 400	Research project 400	20
FNH 421	International nutrition 421	20
Total credits for compulsory modules		60
Total compulsory modules Nutritional Science option = (142)		

A minimum of (624) credits is required to obtain the degree with the option in Public Health Nutrition .
A minimum of (613) credits is required to obtain the degree with the option in Nutritional Science .

Field of study	Dept	Code
BSc in Nutrition and Food Science	VDW	03134012

Please note: Last intake for new or transfers 2013 academic year

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
FSG 110	Physiology 110	6
LST 110	Language and study skills 110	6

MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
VDS 110	**Basic food preparation 110**	**6**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**82**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
CMY 127	**General chemistry 127**	**16**
FSG 120	**Physiology 120**	**6**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
VDS 121	**Basic food preparation 121**	**6**
Total credits for compulsory modules		**66**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (148) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
FST 250	**Introduction to food science and technology 250**	**12**
MBY 251	**Bacteriology 251**	**12**
VDG 311	**Nutrition 311**	**17**
VDS 210	**Food commodities and preparation 210**	**18**
Total credits for compulsory modules		**83**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
FST 260	**Principles of food processing and preservation 260**	**12**
MBY 262	**Food microbiology 262**	**12**
VDG 321	**Nutrition during life cycle 321**	**17**
VDS 221	**Food commodities and preparation 221**	**18**
Total credits for compulsory modules		**83**
Compulsory credits = (166) Elective credits = (0)		

Third year, first semester:		
Code	**Name**	**Crdt**
FST 350	Integrated food science 350	18
FST 351	Food chemistry (1) 351	18
FST 352	Food chemistry (2) 352	18
VDS 310	Consumer food research 310	21
Total credits for compulsory modules		75

Third year, second semester:		
Code	**Name**	**Crdt**
BCM 368	Molecular basis of 368	18
VVW 363	Food, nutrition and health 363	21
VVW 364	Food composition and applied nutritional programmes 364	18
Total credits for compulsory modules		57

Compulsory credits = (132) Elective credits = (0)
A minimum of (446) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Physics	PHY	02133202

First year, first semester:		
Code	**Name**	**Crdt**
LST 110	Language and study skills 110	6
PHY 114	First course in physics 114	16
WTW 114	Calculus 114	16
Total credits for compulsory modules		38

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
PHY 124	First course in physics 124	16
WTW 126	Linear algebra 126	8
WTW 128	Calculus 128	8
Total credits for compulsory modules		38
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

CMY 117,127 are recommended. Electives can be chosen from eg Mathematics, Meteorology, Geology, Geography, IT, Mathematical Statistics, Computer Science, Biochemistry, Zoology etc.
Compulsory credits = (76) Elective credits = (64) Total credits = (140)

Second year, first semester:		
Code	**Name**	**Crdt**
PHY 255	**Waves, thermodynamics and modern physics 255**	**24**
WTW 211	**Linear algebra 211**	**12**
WTW 218	**Calculus 218**	**12**
Total credits for compulsory modules		**48**

Second year, second semester:		
Code	**Name**	**Crdt**
PHY 263	**General physics 263**	**24**
WTW 220	**Analysis 220**	**12**
WTW 248	**Vector analysis 248**	**12**
Total credits for compulsory modules		**48**

Electives can be chosen from eg Mathematics, Meteorology, Geology, Geography, IT and Mathematical Statistics etc.
Compulsory credits = (96) Elective credits = (48) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
PHY 356	**Electronics, magnetism and quantum mechanics 356**	**36**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
PHY 364	**General physics 364**	**36**
Total credits for compulsory modules		**36**

PHY 353 and/or PHY 363 can be chosen as elective modules.
Compulsory credits = (72) Elective credits = (72) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Plant Science	**BOT**	**03133091**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**72**
Students specialising in plant ecology/taxonomy: Replace BCM 255 and BCM 256 with GKD 250.		

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GLY 161	**Historical geology 161**	**8**
GLY 162	**Environmental geology 162**	**8**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**64**
Students NOT specialising in plant ecology/taxonomy: Replace GLY161 and GLY162 with either PLG262 or HSC260 and an additional elective module with at least 4 credits.		
Compulsory credits = (136) Elective credits = (8) Total credits = (144)		

Third year, first semester:		
Code	**Name**	**Crdt**
BOT 356	**Plant ecophysiology 356**	**18**
BOT 358	**Plant ecology 358**	**18**
Total credits for compulsory modules		**36**

Third year, second semester:		
Code	**Name**	**Crdt**
BOT 365	**Phytomedicine 365**	**18**
BOT 366	**Plant diversity 366**	**18**
BTC 361	**Plant genetics and crop biotechnology 361**	**18**
Total credits for compulsory modules		**54**

Plant ecology specialisation: Students take ZEN 364(18) and suitable elective modules.
Compulsory credits = (90) Elective credits = (54) Total credits = (144)
A minimum of (428) credits is required to obtain the degree.

Field of study	Dept	Code
BSc in Zoology	**ZEN**	**03133021**

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**

MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
MBY 251	**Bacteriology 251**	**12**
ZEN 251	**Invertebrate biology 251**	**12**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GLY 161	**Historical geology 161**	**8**
GLY 162	**Environmental geology 162**	**8**
GTS 261	**Genetic variation and evolution 261**	**12**
MBY 261	**Mycology 261**	**12**
ZEN 261	**African vertebrates 261**	**12**
Total credits for compulsory modules		**64**

Compulsory credits = (136) Elective credits = (12) Total credits = (148)

Third year, first semester:		
Code	**Name**	**Crdt**
ZEN 351	Population ecology 351	18
ZEN 352	Mammalogy 352	18
ZEN 353	Community ecology 353	18
ZEN 354	Physiology 354	18
Total credits for compulsory modules		72

Third year, second semester:		
Code	**Name**	**Crdt**
ZEN 361	Ecophysiology 361	18
ZEN 362	Evolution and phylogeny 362	18
ZEN 363	Behavioural ecology 363	18
ZEN 364	Conservation ecology 364	18
Total credits for compulsory modules		72

Compulsory credits = (144) Elective credits = (0)
A minimum of (432) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric in Agricultural Economics/Agribusiness Management	LEK	03130050

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
FRK 111	Financial accounting 111	10
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		64

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
BOT 161	Plant biology 161	8

CMY 127	**General chemistry 127**	**16**
FRK 121	**Financial accounting 121**	**12**
GTS 161	**Introductory genetics 161**	**8**
VKU 120	**Animal science 120**	**8**
Total credits for compulsory modules		**58**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (122) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
EKN 110	**Economics 110**	**10**
FST 250	**Introduction to food science and technology 250**	**12**
GKD 250	**Introductory soil science 250**	**12**
LEK 210	**Introduction to agricultural economics 210**	**12**
STK 110	**Statistics 110***	**13**
VKU 250	**Animal science 250**	**6**
Total credits for compulsory modules		**65**
*Students who do not qualify for STK 110 must register for STK 113 and STK 123		

Second year, second semester:		
Code	**Name**	**Crdt**
EKN 120	**Economics 120**	**10**
LBU 260	**Agroclimatology 260**	**12**
LEK 220	**Agricultural economics 220**	**12**
PPK 251	**Sustainable production systems 251**	**12**
STK 120	**Statistics 120**	**13**
VKU 260	**Animal science 260**	**12**
Total credits for compulsory modules		**71**

Compulsory credits = (136) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BER 210	**Business law 210**	**16**
EKN 224	**Economics 224**	**16**
HSC 351	**Nursery management: Principles and practices 351**	**14**
LEK 310	**Agricultural economics 310**	**12**
STK 210	**Statistics 210**	**20**
Total credits for compulsory modules		**78**

Third year, second semester:		
Code	**Name**	**Crdt**
AGV 421	**Communication 421**	**20**
BEL 220	**Taxation 220**	**16**
EKN 244	**Economics 244**	**16**
LEK 320	**Agricultural economics 320**	**18**
STK 281	**Statistics 281**	**10**
Total credits for compulsory modules		**80**

Compulsory credits = (158) Elective credits = (34) Total credits = (192)

Fourth year, first semester:		
Code	**Name**	**Crdt**
ARD 480	**Agricultural and rural development studies 480**	**20**
EKN 314	**Economics 314**	**20**
LEK 410	**Agricultural market and price analysis 410**	**24**
LEK 415	**Agricultural economics 415**	**18**
Total credits for compulsory modules		**82**

Fourth year, second semester:		
Code	**Name**	**Crdt**
ARD 480	**Agricultural and rural development studies 480**	**20**
LEK 421	**Agricultural economics 421**	**24**
LEK 424	**Introduction to resource economics 424**	**15**
Total credits for compulsory modules		**59**

Elective modules can be chosen from the following: STK 310 (take note of the prerequisites), STK 320, WDE 320 and any modules from Animal and Wildlife Sciences and Plant Production and Soil Sciences on 400-level that do not clash on the lecture, practical or examination timetable.

Compulsory credits = (141) Elective credits = (20) Total credits = (161)

A minimum of (611) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric in Animal Science	VKU	03130140

First year, first semester:		
Code	Name	Crdt
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	Name	Crdt
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16
BOT 161	Plant biology 161	8
CMY 127	General chemistry 127	16
GTS 161	Introductory genetics 161	8
MBY 161	Introduction to microbiology 161	8
VKU 120	Animal science 120	8
Total credits for compulsory modules		70
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (146) Elective credits = (0)		

Second year, first semester:		
Code	Name	Crdt
BCM 251	Introduction to proteins and enzymes 251	12
BCM 252	Carbohydrate metabolism 252	12
DAF 200	Animal anatomy and physiology 200	18
GKD 250	Introductory soil science 250	12
GTS 251	Molecular genetics 251	12
PPK 251	Sustainable production systems 251	12
VKU 250	Animal science 250	8
Total credits for compulsory modules		86

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	Lipid and nitrogen metabolism 261	12
BCM 262	Biochemistry in perspective 262	12
DAF 200	Animal anatomy and physiology 200	18
GTS 261	Genetic variation and evolution 261	12
VKU 260	Animal science 260	12
Total credits for compulsory modules		66

Compulsory credits = (152) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BME 210	Biometry 210	24
DAN 310	Animal anatomy 310	8
DFS 311	Animal physiology 311	10
LEK 210	Introduction to agricultural economics 210	12
RPL 310	Reproduction science 310	8
VGE 301	Nutrition science 301	16
WDE 310	Principles of veld management 310	14
Total credits for compulsory modules		92

Third year, second semester:		
Code	**Name**	**Crdt**
DFS 320	Growth physiology 320	10
LBU 260	Agtoclimatology 260	12
RPL 320	Reproduction science 320	10
TLR 320	Animal breeding 320	10
VGE 301	Nutrition science 301	16
VKU 362	Animal science biotechnology 362	8
WDE 320	Planted pastures and foddercrops 320	14
Total credits for compulsory modules		80

Compulsory credits = (176) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
GVK 420	Large stock science 420	12
PVK 420	Poultry science 420	12
TLR 411	Animal breeding 411	12
VGE 423	Nutrition science 423	16

VKF 411	Animal science pharmacology 411	12
VKU 400	Research methodology	8
Total credits for compulsory modules		72

Fourth year, second semester:		
Code	Name	Crdt
KVK 420	Small stock science 420	12
TLR 420	Animal breeding 420	12
VGE 411	Nutrition science 411	18
VGE421	Nutrition science 421	16
VKD 410	Pig science 410	8
VKU 400	Research methodology 400	8
VSX 420	Meat and dairy science 420	10
WKE 420	Wildlife science 420	10
Total credits for compulsory modules		94

Compulsory credits = (166) Elective credits = (0)
A minimum of (614) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric in Animal Science/Pasture Science	VKU	03130250

First year, first semester:		
Code	Name	Crdt
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	Name	Crdt
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16
BOT 161	Plant biology 161	8
CMY 127	General chemistry 127	16

GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
VKU 120	**Animal science 120**	**8**
Total credits for compulsory modules		**70**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BCM 252	**Carbohydrate metabolism 252**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
DAF 200	**Animal anatomy and physiology 200**	**18**
GKD 250	**Introductory soil science 250**	**12**
PPK 251	**Sustainable production systems 251**	**12**
VKU 250	**Animal science 250**	**8**
Total credits for compulsory modules		**86**

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	**Lipid and nitrogen metabolism 261**	**12**
BCM 262	**Biochemistry in perspective 262**	**12**
BOT 261	**Plant physiology and biotechnology 261**	**12**
DAF 200	**Animal anatomy and physiology 200**	**18**
GTS 261	**Genetic variation and evolution 261**	**12**
VKU 260	**Animal science 260**	**12**
Total credits for compulsory modules		**78**

Compulsory credits = (164) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BME 210	**Biometry 210**	**24**
DAN 310	**Animal anatomy 310**	**8**
DFS 311	**Animal physiology 311**	**10**
LEK 210	**Introduction to agricultural economics 210**	**12**
RPL 310	**Reproduction science 310**	**8**
VGE 301	**Nutrition science 301**	**16**
WDE 310	**Principles of veld management 310**	**14**
Total credits for compulsory modules		**92**

Third year, second semester:		
Code	**Name**	**Crdt**
DFS 320	Growth physiology 320	10
LBU 260	Agroclimatology 260	12
RPL 320	Reproduction science 320	10
TLR 320	Animal breeding 320	10
VGE 301	Nutrition science 301	16
WDE 320	Planted pastures and foddercrops 320	14
Total credits for compulsory modules		72

Compulsory credits = (164) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
GKD 350	Soil classification and surveying 350	14
GVK 420	Large stock science 420	12
VGE 423	Nutrition science 423	16
VKF 411	Animal science pharmacology 411	12
VKU 400	Research methodology 400	8
WDE 450	Environmental resource assessment and management 450	20
Total credits for compulsory modules		82

Fourth year, second semester:		
Code	**Name**	**Crdt**
APS 461	Crop physiology 461	14
KVK 420	Small stock science 420	12
VGE 411	Nutrition science 411	18
VGE 421	Nutrition science 421	16
VKU 400	Research methodology 400	8
VSX420	Meat and dairy science 420	10
WKE 420	Wildlife science 420	10
Total credits for compulsory modules		88

Compulsory credits = (170) Elective credits = (0)
A minimum of (638) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric Option: Applied Plant and Soil Sciences	**PGW**	**03130162**

First year, first semester:		
Students who want to enrol for the main subjects: Agronomy, Horticulture or Pasture Science, must register for the BScAgric Option: Applied Plant and Soil Sciences degree programme.		
Code	**Name**	**Crdt**
CMY 117	**General chemistry 117**	**16**
LST 110	**Language and study skills 110**	**6**
MLB 111	**Molecular and cell biology 111**	**16**
PHY 131	**General physics 131**	**16**
WTW 134	**Mathematics 134**	**16**
Total credits for compulsory modules		**70**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BME 120	**Biometry 120**	**16**
BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
Total credits for compulsory modules		**62**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		

Compulsory credits = (132) Elective credits = (8) Total credits = (140)
Electives: ZEN 161 or VKU 120

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
BOT 251	**South African flora and vegetation 251**	**12**
GKD 250	**Introductory soil science 250**	**12**
GTS 251	**Molecular genetics 251**	**12**
LEK 210	**Introduction to agricultural economics 210**	**12**
PLG 251	**Introduction: Crop protection 251**	**12**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	Plant physiology and biotechnology 261	12
GTS 261	Genetic variation and evolution 261	12
LBU 260	Agroclimatology 260	12
LEK 220	Agricultural economics 220	12
PLG 262	Principles of plant pathology 262	12
PPK 251	Sustainable production systems 251	12
Total credits for compulsory modules		72

Compulsory credits = (144) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BOT 356	Plant ecophysiology 356	18
GKD 350	Soil classification and surveying 350	14
HSC 351	Nursery management: Principles and practises 351	14
PGW 350	Soil-water-relationship and irrigation 350	16
WDE 310	Principles of veld management 310	14
Total credits for compulsory modules		76

Third year, second semester:		
Code	**Name**	**Crdt**
AGR 361	Field crops 361	14
GKD 320	Soil chemistry 320	14
PLG 363	Plant disease control 363	18
WDE 320	Planted pastures and foddercrops 320	14
ZEN 365	Applied entomology 365	18
Total credits for compulsory modules		78

Compulsory credits = (154) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
AGR 410	Vegetable crops 410	14
HSC 490	Ornament horticulture 490	14
LKM 450	Environmental biophysics 450	16
PGW 400	Seminar 400	10
PGW 421	Experimental design and analysis 421	14
WDE 450	Environmental resource assessment and management 450	20
Total credits for compulsory modules		88

Fourth year, second semester:		
Code	**Name**	**Crdt**
APS 461	Crop physiology 461	14
GKD 420	Soil fertility, soil microbiology and plant nutrition 420	14
HSC 420	Fruit tree crops 420	26
OKW 413	Weed science 413	14
PGW 400	Seminar 400	10
Total credits for compulsory modules		78

Compulsory credits = (166) Elective credits = (0)
A minimum of (604) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric in Food Science and Technology	VDW	03130370

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16
BOT 161	Plant biology 161	8
CMY 127	General chemistry 127	16
GTS 161	Introductory genetics 161	8
MBY 161	Introduction to microbiology 161	8
ZEN 161	Animal diversity 161	8
Total credits for compulsory modules		70
* Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)		
Compulsory credits = (140) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	Introduction to proteins and enzymes	12
BCM 252	Carbohydrate metabolism 252	12
FST 250	Introduction to food science and technology 250	12
LEK 210	Introduction to agricultural economics 210	12
MBY 251	Bacteriology 251	12
VDG 250	Nutrition	12
Total credits for compulsory modules		72

Second year, second semester:		
Code	**Name**	**Crdt**
BCM 261	Lipid and nitrogen metabolism 261	12
BCM 262	Biochemistry in perspective 262	12
FST 260	Principles of food processing and preservation 260	12
LEK 220	Agricultural economics 220	12
MBY 261	Mycology 261	12
MBY 262	Food microbiology 262	12
Total credits for compulsory modules		72

Compulsory credits = (132) Elective credits = (12) Total credits = (144)

Third year, first semester:		
Code	**Name**	**Crdt**
FST 350	Integrated food science 350	18
FST 351	Food chemistry (1) 351	18
FST 352	Food chemistry (2) 352	18
FST 353	Food engineering 353	18
Total credits for compulsory modules		72

Third year, second semester:		
Code	**Name**	**Crdt**
FST 360	Principles of the science and technology of plant foods 360	18
FST 361	Animal food science 361	18
LEK 320	Agricultural economics 320	18
FST 362	Advanced animal and plant foods microbiology 362	18
Total credits for compulsory modules		72

Compulsory credits = (144) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
FST 400	Research methodology and seminar 400	10
FST 402	Advanced plant food science and technology 402	10
FST 412	Sensory analysis 412	10
FST 413	Product development and quality management 413	30
FST 420	Advanced food science 420	10
FST 463	Research project 463	20
Total credits for compulsory modules		90

Fourth year, second semester:		
Code	**Name**	**Crdt**
FST 400	Research methodology and seminar 400	10
FST 401	Animal food technology 401	20
FST 402	Advanced plant food science and technology 402	10
FST 420	Advanced food science 420	10
FST 463	Research project 463	20
Total credits for compulsory modules		70

Compulsory credits = (160) Elective credits = (0)
A minimum of (588) credits is required to obtain the degree.

Field of study	Dept	Code
BScAgric in Plant Pathology	MBY	03130321

First year, first semester:		
Code	**Name**	**Crdt**
CMY 117	General chemistry 117	16
LST 110	Language and study skills 110	6
MLB 111	Molecular and cell biology 111	16
PHY 131	General physics 131	16
WTW 134	Mathematics 134	16
Total credits for compulsory modules		70

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101*	6
BME 120	Biometry 120	16

BOT 161	**Plant biology 161**	**8**
CMY 127	**General chemistry 127**	**16**
GTS 161	**Introductory genetics 161**	**8**
MBY 161	**Introduction to microbiology 161**	**8**
ZEN 161	**Animal diversity 161**	**8**
Total credits for compulsory modules		**70**

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

Compulsory credits = (140) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BCM 251	**Introduction to proteins and enzymes 251**	**12**
GTS 251	**Molecular genetics 251**	**12**
LEK 210	**Introduction to agricultural economics 210**	**12**
MBY 251	**Bacteriology 251**	**12**
PLG 251	**Introduction: Crop protection 251**	**12**
Total credits for compulsory modules		**60**

Second year, second semester:		
Code	**Name**	**Crdt**
BOT 261	**Plant physiology and biotechnology 261**	**12**
GTS 261	**Genetic variation and evolution 261**	**12**
LBU 260	**Agroclimatology 260**	**12**
LEK 220	**Agricultural economics 220**	**12**
MBY 261	**Mycology 261**	**12**
PLG 262	**Principles of plant pathology 262**	**12**
PPK 251	**Sustainable production systems 251**	**12**
Total credits for compulsory modules		**84**

Compulsory credits = (144) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BOT 356	**Plant ecophysiology 356**	**18**
GGY 283	**Introductory geographic information systems 283**	**12**
GKD 250	**Introductory soil science 250**	**12**
MBY 351	**Virology 351**	**18**
PLG 351	**General plant pathology 351**	**18**
Total credits for compulsory modules		**78**

Third year, second semester:		
Code	**Name**	**Crdt**
BTC 361	Plant genetics and crop biotechnology 361	18
MBY 364	Genetic manipulation of microbes 364	18
PLG 363	Plant disease control 363	18
MBY 365	Microbial interactions 365	18
Total credits for compulsory modules		72
Compulsory credits = (138) Elective credits = (12) = (150)		

Fourth year, first semester:		
Code	**Name**	**Crdt**
HSC 351	Nursery management: Principles and practices 351	14
PGW 400	Seminar 400	10
PGW 421	Experimental design and analysis 421	14
PLG 462	Research project 462	15
PLG 483	Advanced plant disease control 483	18
Total credits for compulsory modules		71

Fourth year, second semester:		
Code	**Name**	**Crdt**
OKW 413	Weed science 413	14
PGW 400	Seminar 400	10
PLG 462	Research project 462	15
PLG 463	Plant disease epidemiology 463	18
PLG 490	Current concepts in plant pathology 490	18
ZEN 365	Applied entomology 365	18
Total credits for compulsory modules		93
Compulsory credits = (164) Elective credits = (0)		
A minimum of (598) credits is required to obtain the degree.		

Field of study	Dept	Code
BConsumer Science in Clothing: Retail Management	VBR	02130124

First year, first semester:		
Code	**Name**	**Crdt**
BEM 110	Marketing management 110	10
EKN 110	Economics 110	10
FRK 111	Financial accounting 111	10
KLR 110	Clothing production: Sewing techniques 110	9
LST 110	Language and study skills 110	6
OBG 111	Design principles 111	7
STK 110	Statistics 110**	13
Total credits for compulsory modules		65

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	Academic information management 101 *	6
BEM 122	Marketing applications 122	10
EKN 120	Economics 120	10
EST 121	Aesthetics 121	9
FRK 121	Financial accounting 121	12
KLR 120	Clothing product: Processes 120	9
Total credits for compulsory modules		56

***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters)
**Students who do not qualify for STK 110 must register for STK 113 and STK 123

Compulsory credits = (121) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BEM 212	Consumer behaviour 212	16
KLD 210	Costume and fashion history 210	12
KLR 211	Flat pattern design 211	12
OBS 114	Business management 114	10
TKS 212	Textiles: Utility, fibres and yarns 212	14
Total credits for compulsory modules		64

Second year, second semester:		
Code	**Name**	**Crdt**
BEM 224	Integrated brand communication 224	16
INF 281	Informatics 281	3
KLD 222	Fashion forecasting 222	12
KLR 221	Pattern use and good fit 221	10
OBS 124	Business management 124	10
TKS 222	Textiles: Structures and finishes 222	10
Total credits for compulsory modules		61

Compulsory credits = (131) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BEM 314	Marketing research 314	20
BER 210	Business law 210	16
KLD 311	Social and cultural aspects of clothing 311	15
OBS 210	Business management 210	16
Total credits for compulsory modules		67

Third year, second semester:		
Code	**Name**	**Crdt**
BEM 321	Strategic marketing 321	20
BER 220	Business law 220	16
EST 320	Aesthetics: Product, consumer and environment 320	8
KLR 321	Clothing production 321	11
OBS 220	Business management 220	16
Total credits for compulsory modules		71

Compulsory credits = (138) Elective credits = (0)

Fourth year, first semester:		
Code	**Name**	**Crdt**
KLD 410	Clothing retail management 410	20
KLR 411	Product development 411	19
KTP 403	Experiential training 403	5
KTP 402	Clothing textile project 402	14
TKS 411	New developments, sustainability and textiles in use 411	13
Total credits for compulsory modules		71

Fourth year, second semester:		
Code	**Name**	**Crdt**
KLD 420	**Clothing merchandising 420**	**20**
KTP 403	**Experiential training 403**	**5**
KTP 402	**Clothing textile project 402**	**14**
TKS 421	**Textile: marketing and consumer aspects 421**	**15**
Total credits for compulsory modules		**54**

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" must be successfully completed together with a complete portfolio before the degree will be conferred.

Compulsory credits = (125) Elective credits = (0)
A minimum of (509) credits is required to obtain the degree.

Field of study	Dept	Code
BConsumer Science in Foods: Retail Management	**VBR**	**02130114**

First year, first semester:		
Code	**Name**	**Crdt**
BEM 110	**Marketing management 110**	**10**
EKN 110	**Economics 110**	**10**
LST 110	**Language and study skills 110**	**6**
FRK 111	**Financial accounting 111**	**10**
OBG 111	**Design principles 111**	**7**
OBS 114	**Business management 114**	**10**
STK 110	**Statistics 110****	**13**
VDS 111	**Basic food preparation 111**	**6**
Total credits for compulsory modules		**72**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BEM 122	**Marketing applications 122**	**10**

EKN 120	**Economics 120**	**10**
FRK 121	**Financial accounting 121**	**12**
OBS 124	**Business management 124**	**10**
VDS 121	**Basic food preparation 121**	**6**
Total credits for compulsory modules		**54**
***** Students may enrol for AIM 111 and AIM 121 instead of AIM 101 (the same content presented over 2 semesters). **Students who do not qualify for STK 110 must register for STK 113 and STK 123		
Compulsory credits = (126) Elective credits = (0)		

Second year, first semester:		
Code	**Name**	**Crdt**
BEM 212	**Consumer behaviour 212**	**16**
BER 210	**Business law 210**	**16**
FSG 110	**Physiology 110**	**6**
OBS 210	**Business management 210**	**16**
VDS 210	**Food commodities and preparation 210**	**18**
Total credits for compulsory modules		**72**

Second year, second semester:		
Code	**Name**	**Crdt**
BEM 224	**Integrated brand communication 224**	**16**
BER 220	**Business law 220**	**16**
FSG 120	**Physiology 120**	**6**
INF 281	**Informatics 281**	**3**
VDS 221	**Food commodities and preparation 221**	**18**
Total credits for compulsory modules		**59**

Compulsory credits = (131) Elective credits = (0)		
Third year, first semester:		
Code	**Name**	**Crdt**
BEM 314	**Marketing research 314**	**20**
VDG 311	**Nutrition 311**	**17**
VDS 310	**Consumer food research 310**	**21**
VDS 354	**Food safety and hygiene 354**	**12**
Total credits for compulsory modules		**70**

Third year, second semester:		
Code	**Name**	**Crdt**
ABV 320	**Labour relations 320**	**20**
BEM 321	**Strategic marketing 321**	**20**

EST 320	**Aesthetics: Product, consumer and environment 320**	**8**
VDG 321	**Nutrition during life cycle 321**	**17**
Total credits for compulsory modules		**65**

Compulsory credits = (135) Elective credits = (0)

Fourth year, first semester:

Code	Name	Crdt
FST 412	**Sensory evaluation 412**	**10**
OPI 400	**Experiential training in industry 400***	**5**
VDS 413	**Recipe development and standardisation 413**	**24**
VDS 417	**Consumer aspects of foods 417**	**15**
VNP 480	**Food research project 480**	**14**
Total credits for compulsory modules		**68**

Fourth year, second semester:

Code	Name	Crdt
OPI 400	**Experiential training in industry 400***	**5**
VDB 420	**Food service management 420**	**21**
VDS 427	**Food retail and visual merchandising 427**	**17**
VNP 480	**Food research project 480**	**14**
Total credits for compulsory modules		**57**

*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 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,

Compulsory credits = (131) Elective credits = (0)

A minimum of (523) credits is required to obtain the degree.

Field of study	Dept	Code
BConsumer Science in Hospitality Management	**VBR**	**02130115**

First year, first semester:		
Code	**Name**	**Crdt**
BEM 110	**Marketing management 110**	**10**
EKN 110	**Economics 110**	**10**
FRK 111	**Financial accounting 111**	**10**
FSG 110	**Physiology 110**	**6**
LST 110	**Language and study skills 110**	**6**
OBG 111	**Design principles 111**	**7**
OBS 114	**Business management 114**	**10**
STK 110	**Statistics 110****	**13**
VDS 111	**Basic food preparation 111**	**6**
Total credits for compulsory modules		**78**

First year, second semester:		
Code	**Name**	**Crdt**
AIM 101	**Academic information management 101***	**6**
BEM 122	**Marketing applications 122**	**10**
EKN 120	**Economics 120**	**10**
FRK 121	**Financial accounting**	**12**
FSG 120	**Physiology 120**	**6**
OBS 124	**Business management 124**	**10**
VDS 121	**Basic food preparation 121**	**6**
Total credits for compulsory modules		**60**

***** Students may enrol for AIM111 and AIM121 instead of AIM101 (the same content presented over 2 semesters).
**Students who do not qualify for STK 110 must register for STK 113 and STK 123

Compulsory credits = (138) Elective credits = (0)

Second year, first semester:		
Code	**Name**	**Crdt**
BEM 212	**Consumer behaviour 212**	**16**
OBS 210	**Business management 210**	**16**
TBE 210	**Tourism management 210**	**16**
VDS 210	**Food commodities and preparation 210**	**18**
Total credits for compulsory modules		**66**

Second year, second semester:		
Code	**Name**	**Crdt**
ABV 320	Labour relations 320	20
TBE 220	Tourism management 220	16
VDS 221	Food commodities and preparation 221	18
Total credits for compulsory modules		54

Compulsory credits = (132) Elective credits = (0)

Third year, first semester:		
Code	**Name**	**Crdt**
BEM 314	Marketing research 314	20
TBE 310	Tourism management 310	20
VDG 311	Nutrition 311	17
VDS 354	Food safety and hygiene 354	14
Total credits for compulsory modules		71

Third year, second semester:		
Code	**Name**	**Crdt**
EST 320	Aesthetics: Product, consumer and environment 320	8
VDB 321	Food service management 321	18
VDG 321	Nutrition during life cycle 321	17
VDS 322	Large-scale food production and restaurant management 322	29
Total credits for compulsory modules		72
Compulsory credits = (143) Elective credits = (0)		

Fourth year, first semester:		
Code	**Name**	**Crdt**
OPI 400	Experiential training in industry 400*	5
VDS 413	Recipe development and standardisation 413	30
VDS 414	Culinary art 414	28
VNP 480	Food research project 480	14
Total credits for compulsory modules		77

Fourth year, second semester:		
Code	**Name**	**Crdt**
OPI 400	Experiential training in industry 400*	5
VDB 420	Food service management 420	21
VDS 424	Culinary art 424	19
VNP 480	Food research project480	14
Total credits for compulsory modules		59

*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 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,
Compulsory credits = (145) Elective credits = (0)
A minimum of (558) credits is required to obtain the degree.

Sc.7 DIPLOMAS

A Senior Certificate must be included in all applications.

Advanced University Diploma in Extension and Rural Development (Code 03120200)

The admission requirements are:

- an appropriate initial university diploma in one of the Agricultural disciplines plus one year appropriate extensive experience; or
- an appropriate BTech degree or National Diploma plus one year relevant extensive experience; or
- an appropriate Agricultural Diploma or related diploma plus five years' relevant extensive experience; or
- a qualification deemed appropriate by the Senate of the University plus approved experience (RPL).

POSTGRADUATE STUDIES

See the Postgraduate yearbook of the Faculty of Natural and Agricultural Sciences for more detail.

Sc.8 HONOURS DEGREES

SC.8.1 Bachelor of Science Honours [BScHons]

Also consult General Regulations G.1.3; G.16 – G. 29 and G.62, and postgraduate yearbook.

(a) Admission requirements and prerequisites

(i) **For the BScHons degree**
Subject to the stipulations of General Reg. G.16, a student is only admitted to the study for the honours degree if he or she holds the BSc degree with an average mark of at least 60% and provided that he or she complies with the stipulations for the particular modules.

(ii) The curriculum is compiled in consultation with the head of department, from whom full details may be obtained except if mentioned otherwise.

(iii) In cases where the required module or linguistic basis is lacking, additional modules may be prescribed.

(b) Examination admission and pass requirements

For preparation, evaluation and examination of research reports, consult the manual of the Faculty, which is obtainable on request from the head of department. The pass mark for research reports is at least 50%. The stipulations regarding pass requirements for dissertations in General Regulation G.60.2.1 2(a) apply *mutatis mutandis* to research reports.

(c) Degree 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.

(d) Degrees

Discipline	Degree code
Actuarial Science	02240275
Animal Science	03241201
Applied Mathematics	02240171
Biochemistry	03241011
Bioinformatics	03241014
Biotechnology	02240392
Chemistry	02240121
Engineering and Environmental Geology:	
Option: Engineering in Geology	02240370
Option:Hydrogeology	02240373
Entomology	03241031
Financial Engineering	02240274
Food Science	03240921

Genetics	03241051
Geography	02240411
Environmental Analysis and Management	02240412
Geoinformatics	02240408
Geology	02240141
Mathematical Statistics	02240191
Mathematics of Finance	02240272
Mathematics	02240181
Meteorology	02240070
Microbiology	03240911
Nutrition and Food Science	03240922
Option: Crop Science	03240161
Option: Environmental Soil Science	03240902
Option: Medicinal Plant Science	03241090
Physics	02240231
Plant Science	03241091
Wildlife Management	03241001
Zoology	03241021

Sc.8.2 Bachelor of Agricultural Management Honours [BAgrarHons]

Also consult General Regulations G.16 to G.29

(a) Admission requirements

Subject to the stipulations of General Regulations G.1.3 and G.62, a candidate must hold the BInstAgrar degree or an appropriate bachelor's degree to be admitted to the BInstAgrarHons. Additional modules in the field of specialisation other than the honours modules may be prescribed by the Dean, on the recommendation of the head(s) of the department(s) concerned.

(b) Duration

Training is offered full-time.

(c) Curriculum

The curriculum consists of a minimum of eight modules, which include the following:

- A common core of modules, ARD 780, is compulsory for all fields of specialisation, except in the case of the Extension option, for which only ARD 781 and 782 are compulsory. Credit for equivalent modules already passed may be considered, in which case suitable alternative modules will be prescribed by the Dean in consultation with the relevant head of the department concerned.
- The prescribed module work in the student's field of specialisation. Credit for equivalent modules already passed may be considered, in which case suitable alternative modules will be prescribed by the Dean in consultation with the head of the department concerned.
- Additional modules required for the particular field of specialisation, as stipulated by the Dean in consultation with the head of the department concerned.

(d) Degree with distinction

A student must obtain a weighted average of at least 75 % in all the prescribed modules, with a minimum of 65 % in each of the modules to pass the degree with distinction.

(e) Degrees

Discipline	Degree code
Agribusiness Management	03240004
Agricultural Economics	03240002
Crop Protection	03240005
Extension and Rural Development	03240001
Rural Development Planning	03240003

Sc.9 MASTER'S DEGREES

Sc.9.1 Master of Science [MSc]

Also consult General Regulations G.30 – G.44.

(a) Admission requirements for the MSc degree

Subject to the stipulations of General Regulations G.30, G.1.3 and G.62, an applicable BScHons degree is a prerequisite for admission. Additional requirements may be set by the Dean on the recommendation of the head of department. A candidate with an average mark of less than 60% for the honours degree will only be admitted to the MSc degree programme with the approval of the Dean on the recommendation of the head of department.

(b) Conferment of degree

The MSc degree is conferred by virtue of a dissertation and such additional postgraduate modules as may be prescribed.

(c) Pass requirements

(i) A pass mark of at least 50% must be obtained in both the dissertations and the additional prescribed modules, if such additional module work is prescribed.

(ii) Guidelines with regard to the preparation, evaluation and examination of dissertation is available from the head of department on request. The pass mark for dissertations is at least 50%. The stipulations with regard to pass requirements for dissertations in G.60.2.1.2 (a) apply *mutatis mutandis* to mini-dissertations.

(d) Degree 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.

(e) General

Students should take particular note of the maximum period of registration (General Regulation G.32.4), as well as of the requirement regarding submission of a draft article/articles for publication (General Regulation G. 61).

(f) Degrees

Discipline	Degree code
Actuarial Science	02250395
Applied Mathematics	02250171
Applied Mineralogy	02250381
Applied Statistics	02250401
Biochemistry	03251011
Bioinformatics	03251014
Biotechnology	03251052
Chemistry	02250121
Engineering and Environmental Geology	02250372
Engineering Geology	02250371
Entomology	03251031
Environment and Society (Coursework)	03251032
Environmental Ecology (Coursework)	03251033
Environmental Economics (Coursework)	03251034
Option: Environmental Education (Coursework)	03251036
Option: Environmental Management (Coursework)	03251037
Exploration Geophysics	02250431
Financial Engineering	02250184
Food Science	03250921
Genetics	03251051
Geography	02250411
Geoinformatics	02250412
Geology	02250141
Mathematical Statistics	02250191
Mathematics Education	02250183
Mathematics of Finance	02250182
Mathematics	02250181
Option: Air Quality Management (Coursework)	03251038
Option: Hydreogeology	02250373
Option: Medicinal Plant Science	03251090
Option: Forest Science	03251050
Option: Forest Science and the Environment (Coursework)	03251039
Meteorology	02250070
Microbiology	03250911
Nutrition	03251106
Physics	02250231
Plant Pathology	03250881
Plant Science	03251091
Postharvest Technology	03251102
Science Education	02250442
Soil Science	03250901
Water Resource Management (Coursework)	03251035
Wildlife Management	03251001
Zoology	03251021

Sc.9.2 Master of Philosophy [MPhil] (Code: 03250700)

Also consult General Regulation G. 62

(a) Admission requirements
Students wishing to enrol for the MPhil (Wildlife Management) should have a approved four-year first degree at a recognised university or any qualification that is accepted by the Senate as equivalent to it in terms of Regulation G. 62.

(b) Duration
The duration of the internet-based part-time programme is two years. The theoretical component forms 40%, the research project 35% and the practical component 25% of the programme.

(c) Curriculum
This programme aims to educate candidates interested in this field but who come from non-biological backgrounds. It is a postgraduate programme focusing on the philosophy, ethics, ecological principles and application of wildlife management.

Sc.9.3 Master of Agricultural Science [MScAgric]

Also consult General Regulations G.30 to G.44.

(a) Requirements for admission
Subject to the stipulations of General Regulations G.1.3 and G.62, the four-year BScAgric degree with an average of 60% in the final year of the major subject is a requirement for admission to the MScAgric degree. Additional requirements may be stipulated by the head of department.

(b) Duration
Duration of study is at least two years of uninterrupted full-time study (or the part-time equivalent) at this University.

(c) Residence
The Dean may on the recommendation of the head of the department concerned, set particular requirements concerning residence during master's degree studies.

(d) Curricula
The curriculum for the MScAgric degree consists of:
(i) a dissertation; and
further study in the major subject, supplemented by ancillary module/s as may be required by the Dean, on the recommendation of the head of department. Students who hold the BScAgricHons degree may be exempted from further ancillary modules.
(ii) A total of 240 credits is required for the MScAgric degree, of which 120 are for the dissertation.

(e) Examinations and pass requirements
(i) The final examinations for the MScAgric may only be taken at the end of the second year of study.

(ii) The examinations in the ancillary modules, if required, must be passed before or concurrent with the examinations in the major subject, unless the Board of the Faculty decides differently.
(iii) General Regulation G.12.2, as well as paragraph 4 of the Faculty regulations pertaining to examination admission and pass requirements, are applicable to the calculation of marks.
(iv) A student must pass all prescribed modules as well as the dissertation to obtain the MScAgric degree.
(v) The degree is conferred with distinction on a student who obtains a final mark 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.

(f) General

Students should take particular note of the maximum period of registration (General Regulation G.32.4), as well as of the requirement regarding submission of a draft article/articles for publication (General Regulation G.61).

(g) Degrees

Discipline	Degree code
Agricultural Economics	03250041
Agricultural Extension	03251030
Agronomy	03250454
Animal Science: Production Management	03250441
Animal Science: Animal Breeding and Genetics	03250457
Animal Science: Meat Science	03250122
Animal Science: Production Physiology	03250391
Entomology	03250120
Genetics	03250291
Microbiology	03250071
Pasture Science	03250455
Plant Pathology	03250301
Food Science and Technology	03250261
Horticultural	03250091
Animal Science: Animal Nutrition	03250421
Soil Science	03250456

Sc.9.4 Master of Agricultural Management [MAgrar]

Also consult General Regulations G. 30 to G. 44.

(a) Admission requirements

Subject to the stipulations of General Requirements G.1.3 and G. 62, a candidate must hold the BAgrarHons or an appropriate honours degree for admission to the MAgrar degree study. Additional modules may be prescribed by the Dean on the recommendation of the head of department. A candidate with an average mark of less than 60 % for the honours degree will only be admitted to MAgrar study with the approval of the Dean, on the recommendation of the head of the department.

(b) Curriculum
The curriculum consists of further study in the field of specialisation and a mini-dissertation, which encompasses research conducted by the student under supervision of a member of the academic staff.

(c) Degree with distinction
The degree is conferred with distinction on a student who obtains a final mark of at least 75%, as well as at least 75% for the mini-dissertation and provided that all the members of the Examination Commission indicate in writing that the degree be conferred with distinction.

(d) General
Students must take particular note of the maximum period of registration (General Regulation G.32.4), as well as of the requirement regarding submission of a draft article/articles for publication (General Regulation G. 61).

(e) Degrees

Discipline	Degree code
Agricultural Economics	03252013
Animal Production Management	03252016
Crop Protection	03252015
Extension and Rural Development	03252012
Rural Development Planning	03252014
Plant Quarantine	03252017

Sc.9.5 Master of Consumer Science [MConsumer Science]

(a) Admission requirements
A four-year BConsumer Science or other applicable degree.

(b) Duration
A minimum of two years full-time and a maximum of four years part-time study.

(c) Programme options
There are four disciplines with a further two options to choose from, each with a minimum of 240 credits:

(i) **Dissertation option**

Interior Merchandise Management	02253004
Clothing Management	02253006
General	02253009
Food Management	02253008

(ii) **Coursework option with research report**

Interior Merchandise Management	02253003
Clothing Management	02253005
General	02253010
Food Management	02253007

(d) Curriculum (a minimum of 240 credits)

(i) **Dissertation option**

Research Methodology 814	(30 credits)

Theoretical Orientation	(15 credits)*
Electives (30 credits each) (a minimum of 60 credits)	
VBR 890 (Dissertation)	(120 credits)

(ii) **Coursework option**

Research Methodology 814	(30 credits)
Theoretical Orientation	(15 credits)*
Electives (30 credits each)	(4x30=120 credits)
VBR 892 (Research report)	(60 credits)

*To earn credits for the Theoretical Orientation, at least one of the following options must be taken:

HSK 810:	Theoretical frameworks in cultural studies 810	(15 credits)
HSK 812:	Theoretical frameworks in consumer studies 812	(15 credits)
HSK 813:	Socio-cultural studies 813	(15 credits)
Other applicable orientations offered in and outside the Department can be taken additionally.		(15-30 credits).

Students choose electives on 800-level from the following four electives groupings:

- Clothing and textiles
- Foods, nutrition and food service management
- Interior merchandising and consumer facilitation

Depending on the field of study, a maximum of two postgraduate modules may be selected from disciplines from other departments.
Depending on the academic background of the student and the chosen area of study, it may be required of the student to take additional modules.
Work on the dissertation/research report consists of three parts, namely the research proposal, project execution and an oral presentation of the research results.

A basic module in Statistics is compulsory when a quantitative approach is used for the research project.

(e) Degree 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.

(f) Prerequisites for the dissertation/research report

Consult the Department for more information on the structuring of programmes, the content of the theoretical orientations, and electives including their prerequisites.

(g) Degrees

Discipline	**Degree code**
Interior Merchandise Management	02253004
Interior Merchandise Management (Coursework)	02253003
Clothing Management	02253006
Clothing Management (Coursework)	02253005
General	02253009
General (Coursework)	02253010
Food Management	02253008
Food Management (Coursework)	02253007

DOCTORATES

Sc.10 Doctor of Philosophy [PhD]

Also consult General Regulations G.45 to G.55.

(a) Admission requirements

(i) **PhD degree**

Subject to the stipulations of General Regulations G.1.3, G.45 and G.62, no student will be admitted to the study for a doctor's degree unless he or she holds an applicable master's degree or has been admitted to the status thereof. Further requirements for admission, if any, are set out in the syllabi of the various departments.

(ii) **PhD in Consumer Science**

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:

- Theoretical orientation
- Research methodology (NMN 814)
- The student should also have published at least one article in a research journal during the two years prior to registration for the PhD degree or have proof that the article has been accepted for publication in a refereed journal. Furthermore, it should also be evident from the master's dissertation or publications that research can be undertaken independently.

Please note: The student may be required to do additional modules/coursework.

(b) Duration

A minimum of two years full-time study.

(c) Residence

Doctoral students may be required to reside at the University for further study on the recommendation of the head of department and with the approval of the Dean.

(d) Curriculum

The curriculum for the PhD degree consists of:

(i) theoretical knowledge of the major subject and such ancillary modules as may be required; and

(ii) a thesis.

(e) Conferring of degree

(i) A PhD student must submit a thesis which deals with a topic from the list of subject disciplines.

(ii) The doctoral examination, either written and/or oral, is compulsory and covers the content of the thesis as well as the subdivisions of the field of study on which the thesis is based.

(f) General

Students must take particular note of the maximum period of registration (General

Regulation G. 47), as well as of the requirements regarding the submission of a draft article/articles for publication (General Regulation G. 61).

(g) Degrees

Discipline	Degree code
Agrarian Extension	03262002
Agricultural Economics	03260042
Agronomy	03262164
Animal Production Management	02260545
Animal Science	03260141
Biochemistry	03260012
Biotechnology	03262162
Bioinformatics	03260014
Chemistry	02260451
Consumer Science: Development	02263003
Consumer Science: Food Management	02263004
Consumer Science: Interior Merchandise Management	02263001
Consumer Science: Clothing Management	02263002
Crop Protection	03262021
Engineering and Environmental Geology	02260542
Entomology	03260121
Environment and Society	03260122
Environmental Ecology	03260123
Environmental Economics	03260124
Exploration Geophysics	02260531
Extension and Rural Development	03262002
Food Science	03260272
Genetics	03260292
Geography	02260511
Geoinformatics	02260512
Geology	02260521
Horticultural Science	03262167
Mathematical Sciences	02260761
Meteorology	02260630
Microbiology	03260072
Nutrition	03261006
Option: Air Quality Management	03260129
Option: Environmental Management	03260125
Option: Hydrogeology	02260522
Option: Forest Science	03262160
Option: Medicinal Plant Science	03261090
Pasture Science	03262165
Physics	02260481
Plant Pathology	03260302
Plant Science	03261091
Rural Development Planning	03262023
Science and Mathematics Education	02260753
Soil Science	03262166
Water Resource Management	03260126
Wildlife Management	03261001
Zoology	03261021

Sc.11 Doctor of Science [DSc]

Consult General Regulation G.56.

This degree usually follows on the PhD degree and is conferred by virtue of publications emanating from independent research. The publication must represent a meaningful contribution to a specific subdiscipline.

(a) Guidelines for evaluation

(i) **Disciplines**
The DSc degree in the Faculty of Natural and Agricultural Sciences is conferred byvirtue of published research work in one of the disciplines in the faculty.

(ii) **Criteria**
The work submitted for the DSc must constitute an original and important contribution to scientific knowledge and insight in that it isregarded as a substantial and coherent contribution to the advancement of the frontiers of knowledge and insight into the specific subdiscipline, and proof of the candidate's achievement with regard to international leadership in the specific field of scientific research.
The emphasis in the assessment of the work of a DSc candidate must be placed on originality, substance and excellence.

(iii) **Presentation**
The document submitted for examination must consist of a selection of published articles as well as a substantiated representation in which the grounds for submission and coherency of the work presented is evident.

ALPHABETICAL LIST OF MODULES IN THE FACULTY OF NATURAL AND AGRICULTURAL SCIENCES

 # = Concurrent registration
() = Examination admission
dpw = discussions per week
GS = combined (final) mark (semester/year mark plus examination mark) of at least 40% - 49%
hpw = hours per week
LP = Lecturer's permission
lpw = lectures per week
ppw = practicals per week
spw = seminars per week
TDH = Permission by head of department
tpw = tutorials per week

Language of tuition – options:
Afrikaans: Classes only presented in Afrikaans
English: Classes only presented in English
Both: 2 classes scheduled separately at the same time (1 English and 1 Afrikaans)
Double medium: One class scheduled in which English and Afrikaans are used in the same class

Prerequisites:
: Module must be taken before or together with the module for which it is a prerequisite.

Prerequisite modules: clarification		**Minimum requirements**
[ ]	Code in brackets: [AGR313]	Obtained a minimum of 50%
#	Code followed by #: AGR313#	Concurrent registration
GS	Code followed by GS: AGR313GS	Average of 40-49%

TDH: Approval from the head of department is required to register for the module.
Par 1.2: Refers to the admission requirements for specific modules that appear at the beginning of this publication.

AGR 361 Field crops 361
Academic organisation: Plant Production and Soil Science
Prerequisite: PPK 251
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
Botanical characteristics, classification, growth requirements, production practices and utilisation of crops rich in starch, oil and protein, fibre crops, tobacco, sugarcane and medicinal plants. Visits to research institutions and producers.

AGR 410 Vegetable crops 410
Academic organisation: Plant Production and Soil Science
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
Integration of agronomic, pedological, botanical, economic and management con-

siderations in crop production systems with a view to sustainable maximum economic yield. Case studies of specific crops.

AGV 413 Communication for sustainable rural development 413
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: Second Year – academic level
Contact time: 2 lpw
Period of presentation: Year
Language of tuition: English **Credits:** 20
Module content:
Introduction to the communication process and its importance for sustainable development; the models of communication; critical elements and factors in communication; Communication and perception. Use of non-verbal communication. Persuasion and Credibility. Messages and message treatment; audience and audience identification; channels and methods of communication. Effective listening and feedback. Practical training in communication: Effective speaking; visual aids in communication; managing conflict; report writing. Introduction to Appreciative Inquiry as a communication approach.

AGV 421 Communication 421
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: Second Year – Academic level
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 20
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.

APS 461 Crop physiology 461
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250 and BOT 356
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: English **Credits:** 14
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 photo assimilates 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.

APZ 325 Livestock breeding 325
Academic organisation: Animal and Wildlife Sciences
Prerequisite: GTS 261
Contact time: 2 lpw
Period of presentation: Semester 2

Language of tuition: English **Credits:** 10
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.

ARD 480 Agriculture and rural development studies 480
Academic organisation: Agricultural Economics, Extension and Rural Development
Contact time: 3 lpw
Period of presentation: Year
Language of tuition: English **Credits:** 40
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.

ARD 482 Resources and development 482
Academic organisation: Agricultural Economics, Extension and Rural Development
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 20
Module content:
Review of the most important physical-biological agricultural resources – soil, water, climate, topography, plant species, animal species; differences in characteristics, quality and vulnerability; the concept of optimum land use; resource conservation; general ecological principles; examples of problems caused by mismatching of physical-biological resources and land use during development planning; principles of sensible technology transfer.

BCM251 Introduction to proteins and enzymes 251
Academic organisation: Biochemistry
Prerequisite: CMY 117 GS, CMY 127 GS and MLB 111 GS
Contact time: 2 lpw 0.5 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
Structural and ionic properties of amino acids. Peptides, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Interactions that stabilize protein structure, denaturation and renaturation of proteins. Introduction to methods for the purification of proteins, amino acid composition, and sequence determinations. Introduction to enzyme kinetics and enzyme inhibition. Allosteric enzymes, regulation of enzyme activity, active centres and mechanisms of enzyme catalysis. Examples of industrial applications of enzymes. Practical training in laboratory techniques and Good Laboratory

Practice. Techniques for the quantitative and qualitative analysis of biological molecules. Processing and presentation of scientific data.

BCM 252 Carbohydrate metabolism 252
Academic organisation: Biochemistry
Prerequisite: CMY 117 GS, CMY 127 GS and MLB 111 GS
Contact time: 2 lpw 0.5 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
Biochemistry of carbohydrates. Thermodynamics and bioenergetics. Glycolysis, citric acid cycle and electron transport. Glycogen metabolism, pentose-phosphate pathway, gluconeogenesis and photosynthesis. Practical training in study and analysis of metabolic pathways and enzymes. Scientific method and design: Hypothesis design and testing, method design and scientific controls.

BCM 261 Lipid and nitrogen metabolism 261
Academic organisation: Biochemistry
Prerequisite: CMY 117 GS, CMY 127 GS and MLB 111 GS
Contact time: 2 lpw 0.5 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
Module content:
Biochemistry of lipids, membrane structure, anabolism and catabolism of lipids. Nitrogen metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neuro-transmitters, pigments, hormones and nucleotides from amino acids. Catabolism of pureness and pyrimidines. Therapeutic agents directed against nucleotide metabolism. Examples of in-born errors of metabolism of nitrogen containing compounds. The urea cycle, nitrogen excretion. Practical training in scientific writing skills: evaluation of a scientific report. Techniques for separation and analysis of biological molecules.

BCM 262 Biochemical principles of nutrition and toxicology 262
Academic organisation: Biochemistry
Prerequisite: CMY 117 GS, CMY127 GS and MLB 111 GS
Contact time: 2 lpw 0.5 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
Module content:
Biochemistry of nutrition and toxicology. Proximate analysis of nutrients. Review of energy requirements and expenditure. 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. Interaction between nutrients. Comparison of monogastric and ruminant. Cholesterol, polyunsatured, 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 and diarrhea. Biochemistry of xenobiotics absorption, distribution, metabolism and excretion (ADME), detoxification reactions: oxidation/reduction (Phase I), conjunctions (Phase II); factors affecting metabolism and disposition. Toxic responses: tissue damage and physiological effects, teratogenesis, immunotoxicity, mutagenesis and carcinogenesis. Examples of toxins, biochemical mechanisms of common toxins and their antidotes. Antibiotics and resistance. Natural toxins from fungi, plants and animals: goitrogens, cyanogens, cholinesterase inhibitors,

ergotoxin, aflatoxins. Practical training in analyses of nutrients, fatty acids separations, antiosidant determination, and enzyme activity measurements, PO ration of mitochondria electrophoresis, extraction, solubility and gel permeation techniques.

BCM 351 Biochemistry of proteins 351
Academic organisation: Biochemistry
Prerequisite: BCM 253 and BCM 254
Contact time: 2 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: Double medium **Credits:** 9
Module content:
Biochemistry of amino acids, peptides and proteins. Chemical modification of amino acids. Primary, secondary, tertiary and quaternary structure, protein folding, sequence motifs and domains, supersecondary and supramolecular structure, self assembly. Practical: subcellular fractionation (CBE) and purification of proteins. HPLC of proteins (CBE). Dipeptide sequencing and electrophoresis of proteins.

BCM 352 Proteome analysis 352
Academic organisation: Biochemistry
Prerequisite: BCM 253, BCM 254 and BCM 351 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Quarter 2
Language of tuition: Double medium **Credits:** 9
Module content:
Analysis of amino acid composition and sequence of proteins. Isolation and characterisation of proteins. Introduction to proteomics. Sequence-based characterisation of proteins, scoring matrices and algorithms. Basic techniques for three-dimensional modelling and characterisation.
Practical: introduction to bioinformatics in protein structure-function relation investigations.

BCM 354 Biochemistry of nucleic acids 354
Academic organisation: Biochemistry
Prerequisite: BCM 253 and BCM 254 and BCM 255 and BCM 256 and BCM 263 and BCM 264 and BCM 265 and BCM 266
Contact time: 1 lpw 0.5 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 9
Module content:
Biochemistry of nucleic acids, nucleotides and nitrogen bases. Chemical and enzymatic methods for studying nucleic acid structure. Primary, secondary and tertiary structure of nucleic acids and sequence-induced conformational types, DNA enzymes. Chemical modification of nucleotides and nucleic acids and in vivo repair mechanisms. Application of sequence-specific modifications in drug design and antigene approaches. Sequence and structure-specific interactions between small ligands (dyes and antibiotics) and nucleic acids. Fundamentals of RNA structure; application of principles to understand ribozymes, gene silencing, ribosomes and protein translation. Interaction between nucleic acids and nucleic acids binding proteins, the role of DNA shape in protein-DNA recognition and the biochemical principles of gene regulation.

BCM 355 Immunobiology 355
Academic organisation: Biochemistry
Prerequisite: BCM 253 and BCM 254 and BCM 255 and BCM 256 and BCM 263 and BCM 264 and BCM 265 and BCM 266
Contact time: 1 lpw 0.5 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 9
Module content:
Adaptive and innate immunity. Complement. Organs and cells of the immune response. Cell killing: phagocytosis, apoptosis and necrosis. Anatomy and ontogeny (development) of the immune system. Chemical and cellular techniques of immunology. The origin of diversity in antigen receptors. Practical: working with experimental animals, the synthesis of hapten-protein conjugate, immunisation, bleeding and serum production and an immuno-assay.

BCM 356 Macromolecules of life: Structure-function and Bioinformatics 356 *(To be offered from 2015)*
Academic organisation: Biochemistry
Prerequisite: BCM 251 and BCM 252
Contact time: 2 lpw, 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits**: 18
Module content:
Perspectives on the flow of information from nucleic acids to proteins, the structure and functions of nucleic acids and proteins and their organisation into hierarchical, interdependent systems. Nucleic acid structure as observed in fibres and crystals as well as global DNA and RNA analyses (methods and bioinformatic analyses). Biochemical analyses of nucleotides. DNA-DNA recognition: non-standard and higher order DNA structures. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Principles of small molecule-DNA recognition. Principles of protein-DNA recognition and interactions. Bioinformatics predictions of protein and small molecule DNA interactions. Chemical reactivity of amino acids. Domain structures of proteins and Ramachandran plots. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications, conjugated proteins and bioinformatics predictions. Principles of protein function and protein structure relationships. Protein-ligand and protein-protein interactions. Protein aggregation in disease. Examples of the diverse functions of proteins and peptides, including enzymes, hormones, neurotransmitters, antibodies, receptors, transport and membrane proteins. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance, mass spectrometry and X-ray crystallography. Protein purification and characterisation including, pI, molecular mass, amino acid composition and sequence. Practical training will include interactive computer-guided demonstrations of protein analysis, hands-on practical sessions for nucleic acid purification and chemical structure characterisation, protein expression and purification (including SDS-PAGE), protein sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).

BCM 357 Biocatalysis and integration of metabolism 357 *(To be offered from 2015)*
Academic organisation: Biochemistry
Prerequisite: BCM 251 and BCM 252 and BCM 261
Contact time: 2 lpw 1 ppw

Period of presentation: Semester 1
Language of tuition: Double medium **Credits**: 18
Module content:
Nomenclature: 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. Problems and answers: tutorials of problems and answers based on above concepts. Integration of metabolism; hormones and second messengers; cell signalling; a case study in connectivity among metabolic pathways and their regulation, in for example diabetes and starvation. 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. Practical sessions cover tutorials on calculations, isolation of an enzyme, determination of pH and temperature optimum, determination of Km and Vmax, enzyme activation, enzyme inhibition, purification table and final report, oral defense of report.

BCM 362 Nutritional biochemistry 362
Academic organisation: Biochemistry
Prerequisite: BCM 265
Contact time: 1 lpw
Period of presentation: Quarter 3
Language of tuition: Double medium **Credits:** 4
Module content:
Proximate analysis of nutrients. Review of energy requirements and expenditure. Metabolism of energy-yielding nutrients. 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. Comparison of monogastric and ruminant species. Composition of triglycerides, fatty acids and arteriosclerosis. Cholesterol, polyunsaturated, essential fatty acids and dietary antioxidants. Interactions between nutrients. Biochemical functions of water and fat-soluble vitamins and assessment of vitamin status. Mineral requirements, biochemical function, imbalances and diarrhea.

BCM 363 Xeno biochemistry 363
Academic organisation: Biochemistry
Prerequisite: BCM 265
Contact time: 1 lpw
Period of presentation: Quarter 4
Language of tuition: Double medium **Credits:** 5
Module content:
Metabolism of xenobiotics: absorption, distribution, metabolism and excretion; oxidation/reduction (Phase I), conjugations (Phase II), export from cells (Phase III); factors affecting metabolism and disposition. Toxic responses: tissue damage and physiological effects; teratogenesis, immunotoxicity, mutagenesis and carcinogenesis. Examples of toxins: biochemical mechanisms of common toxins and their antidotes.

BCM 364 Building the cell 364
Academic organisation: Biochemistry
Contact time: 1 lpw 0.5 ppw
Period of presentation: Semester 2

Language of tuition: Double medium **Credits:** 9
Module content:
Membrane structure: plasma membrane structure, organisation of lipid membranes, membrane proteins, glycoproteins and glycolipids, principles of membrane organisation (cytoskeletal components), specialisations of the plasma membrane (neuronal tissue). Transport across cell membranes: major types of membrane transport proteins; diffusion of small molecules across pure phospholipid bilayers; uniporter-catalysed transport of specific molecules; ion channels, intracellular ion environment and membrane electric potential; active ion transport and ATP hydrolysis; cotransport catalysed by symporters and antiporters; osmosis, water channels and the regulation of cell volume. Calculation of free energy change during transport. Synthesis and sorting of plasma membrane, secretory and lysosomal proteins. Protein modifications, folding and quality control in the ER, further glycoprotein processing in the Golgi. Vesicular traffic, protein secretion and endocytosis. Introduction to signaling: G-proteins, adenylyl cyclase, phospholipase C and secondary messenger molecules (cyclic AMP, calcium and inositol-triphosphates).

BCM 365 Immunobiochemistry 365
Academic organisation: Biochemistry
Prerequisite: BCM 355 GS
Contact time: 1 lpw 0.5 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 9
Module content:
Interactions between antigens and antibodies: quantitative and qualitative properties, regulation of the immune response, integrated immunology. Practical: tutorials on integrated and quantitative immunology.

BCM 366 Enzymology 366
Academic organisation: Biochemistry
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 9
Module content:
Nomenclature: 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. Enzyme kinetics: derivation of Michaelis-Menten (MM) equation by equilibrium and steady state assumptions, significance of Km and Vmax in the catalytic efficiency of enzymes and linear transformations of the MM equation. Enzyme inhibition: competitive, uncompetitive, non-competitive and irreversible inhibitors with examples of specific toxins and drugs. Multi-substrates: Cleland nomenclature and multisubstrate reactions. Allosteric enzymes: models by Koshland, Hill and Monod. Problems and answers: tutorials of problems and answers based on above concepts. Practicals: isolation of an enzyme, determination of pH and temperature optimum, determination of Km and Vmax, enzyme activation, enzyme inhibition, purification table and final report, oral defense of report.

BCM 367 Cell structure and function 367 *(To be offered from 2015)*
Academic organisation: Biochemistry
Prerequisite: BCM 251 and BCM 252 and BCM 261
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits**: 18

Module content:
Visualising cell structure and localising proteins within cells. Cell ultrastructure. Purification of subcellular organelles. Culturing of cells. Diversity and commonality of cells. Biomembrane structure. Transmembrane transport of ions and small molecules. Moving proteins into membranes and organelles. Vesicular traffic, secretion, exocytosis and endocytosis. Cell organisation and movement. Cell-cell and cell-matrix adhesion. Practical training includes tutorials on electron, immunofluorescent and confocal microscopy. TLC of neutral lipids and phospholipids. Isolation and characterisation of erythrocyte membranes. Active transport studies in yeast cells.

BCM 368 Molecular basis of disease 368 *(To be offered from 2015)*
Academic organisation: Biochemistry
Prerequisite: BCM 251 and BCM 252 and BCM 261
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits**: 18
Module content:
Normal and abnormal regulation of the cell cycle: The biochemistry of proliferation, quiescence, senescence, differentiation and apoptosis, illustrated by cancer. Host-Pathogen co-evolution: How adaptive immunity emerged from innate immunity. Infection: Molecular and cellular immunobiochemistry of protection against viral, bacterial and parasitic pathogens. Auto-immunity: Molecular mechanisms of the maintenance and failure of the recognition of foreign in the context of self in the mammalian body. Practical training includes debate on ethics of research on animal and human diseases, experimental design and execution of an immunoassay to test for a biomarker antibody of an infectious disease, tutorials to determine the performance of a diagnostic test for disease, including the principle of ROC curve analysis, positive and negative predictiveness, sensitivity, specificity and accuracy, applications of polyclonal and monoclonal antibodies for characterisation of disease with fluorescence, confocal and electron microscopy, flow cytometry and biosensors.

BOT 161 Plant biology 161
Academic organisation: Plant Science
Prerequisite: MLB 111 GS
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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.

BOT 251 South African flora and vegetation 251
Academic organisation: Plant Science
Prerequisite: BOT 161 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
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; centra of plant endemism; rare and threatened plant species; red data lists; biodiversity conservation and ecosystem management; international conventions; conservation status of South African vegetation types.

BOT 261 Plant physiology and biotechnology 261
Academic organisation: Plant Science
Prerequisite: BOT 161, CMY 117, CMY 127 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
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.

BOT 356 Plant ecophysiology 356
Academic organisation: Plant Science
Prerequisite: BOT 161 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 18
Module content:
The emphasis is on the efficiency of the mechanisms whereby C3-, C4- en CAM-plants bind CO_2 and how it is 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 and 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.

BOT 358 Plant ecology 358
Academic organisation: Plant Science
Prerequisite: BOT 161 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 18
Module content:
A description of the environment of plants. Theory of plant community concepts, vegetation change over space and time; floristic and structural composition plant diversity, ecological succession, landscape ecology. Data-processing techniques; ecological interpretation and description of plant communities. Vegetation and environmental management. Fundamentals of plant population biology; life tables; plant breeding systems and pollination; population dynamics; life history strategies; intraspecific competition; interspecific competition and co-existence.

BOT 365 Phytomedicine 365
Academic organisation: Plant Science
Prerequisite: BOT 161 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
The module includes a review on the discovery and use of plant medicines and phyto-therapeutically important molecules obtained from plants. Certain aspects of natural product chemistry ie 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 are presented. The role of these natural products in defence against micro-organisms and herbivores is reviewed. The basics of alternative medicines such as homeopathy, ayurvedic medicine, acu-puncture etc are also discussed. Practical sessions on drug discovery approaches using chromato-graphic techniques for phytochemical analysis of secondary metabolites such as tannins, alkaloids, sterols and saponins are conducted. Bioassays on micro-organisms are done during the practical sessions in order to develop the skills for the potential discovery of new antibiotics. Visits to several pharmaceutical laboratories are arranged.

BOT 366 Plant diversity 366
Academic organisation: Plant Science
Prerequisite: BOT 161 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 18
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.

BTC 361 Plant genetics and crop biotechnology 361
Academic organisation: Genetics
Prerequisite: GTS251 and [GTS261 GS or BOT261 GS] and [GTS351 and GTS352] are recommended
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
Plant genetics and genomics: gene control in plants, epigenetics, co-suppression, forward and reverse genetics, structural and functional genomics. Plant development: signal perception, cell death, control of cell division. 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 and systems biology.

CHM 171 General chemistry 171
Academic organisation: Chemistry
Contact time: 4 lpw 1 ppw 1 web-based period per week 1 dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

CHM 172 General chemistry 172
Academic organisation: Chemistry
Contact time: 4 lpw 1 ppw 1 web-based period per week 1 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

CHM 181 General chemistry 181
Academic organisation: Chemistry
Contact time: 4 lpw 1 ppw 1 web-based period per week 1 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

CHM 215 Chemistry 215
Academic organisation: Chemistry
Prerequisite: CHM 171 or CHM 172 and CHM 181
Contact time: 1 web-based period per week 3 lpw 1 ppw 1 dpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16
Module content:
Organic chemistry. Chemical properties of organic (including aromatic) compounds. Functional group transformation and synthesis. Physical chemistry. Colloid chemistry. Surface chemistry and processes at solid surfaces. PVT properties of real gases.

CHM 226 Chemistry 226
Academic organisation: Chemistry
Prerequisite: CHM 171 or CHM 172 and CHM 181
Contact time: 2 lpw 6 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
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.

CMY 117 General chemistry 117
Academic organisation: Chemistry
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16
Module content:
Theory: General introduction to inorganic and analytical chemistry. Nomenclature of inorganic ions and compounds, stoichiometric calculations concerning chemical reactions, redox reactions, solubilities, atomic structure, periodicity. Inorganic and physical chemistry. Molecular structure and chemical bonding using the VSEPR models. Chemical equilibrium, acids and bases, buffers, precipitation.

CMY 127 General chemistry 127
Academic organisation: Chemistry
Prerequisite: Natural and Agricultural Sciences students: CMY 117 GS
Health Sciences students: none
Contact time: 4 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Theory: General physical-analytical chemistry: Physical behaviour of gases, liquids and solids, intermolecular forces, solutions. Principles of reactivity: energy and chemical reactions, 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, ie carbohydrates, lipids and aminoacids. Practical: Molecular structure (model building), synthesis and properties of simple organic compounds.

CMY 133 Chemistry 133
Academic organisation: Chemistry
Prerequisite: As for BSc Four-year programme
Contact time: 2 lpw Fortnightly practicals 3 dpw Foundation Course
Period of presentation: Semester 1

Language of tuition: English **Credits:** 8
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.

CMY 143 Chemistry 143
Academic organisation: Chemistry
Prerequisite: CMY 133
Contact time: 2 lpw Fortnightly practicals 3 dpw Foundation Course
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
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.

CMY 151 Chemistry 151
Academic organisation: Chemistry
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics and Physical Science in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

CMY 154 Chemistry 154
Academic organisation: Chemistry
Prerequisite: CMY 133 and CMY 143
Contact time: 3 lpw fortnightly practicals 2 tpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Chemical equilibrium; acid and base equilibria; applications of aqueous equilibria: buffers and titrations; introduction to thermochemistry and thermodynamics; introduction to chemical kinetics and organic chemistry: hybridisation, isomers (structural, geometrical and conformational), additions reactions and reaction mechanisms.

CMY 282 Physical chemistry 282
Academic organisation: Chemistry
Prerequisite: CMY 117 and CMY 127
Contact time: 4 lpw 2 ppw 1 tpw

Period of presentation: Quarter 2
Language of tuition: English **Credits:** 12
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. Fundamentals of spectroscopy .

CMY 283 Analytical chemistry 283
Academic organisation: Chemistry
Prerequisite: CMY 117 and CMY 127
Contact time: 4 lpw 2 ppw 1 tpw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 12
Module content:
Theory: Statistical evaluation of data, aqueous solution chemistry,chemical equilibrium, precipitation, neutralisation and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry.

CMY 284 Organic chemistry 284
Academic organisation: Chemistry
Prerequisite: CMY 117 and CMY 127
Contact time: 4 lpw 2 ppw 1 tpw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 12
Module content:
*Selection criteria based on performance in CMY 127 will be applied due to limited capacity in the practical course.
Theory: Resonance, conjugation and aromaticity. Acidity and basicity. Electrophilic addition: alkenes and alkynes. Nucleophilic substitution, elimination, addition: alkyl halides, alchohols, ethers, epoxides, carbonyl compounds: ketones, aldehydes, carboxylic acids and their derivatives.

CMY 285 Inorganic chemistry 285
Academic organisation: Chemistry
Prerequisite: CMY 117 and CMY 127
Contact time: 4 lpw 2 ppw 1 tpw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 12
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. Introduction to IR spectroscopy.

CMY 382 Physical chemistry 382
Academic organisation: Chemistry
Prerequisite: CMY 282, CMY 283, CMY 284 and CMY 285
Contact time: 4 lpw 2 ppw 1 dpw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 18

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.

CMY 383 Analytical chemistry 383
Academic organisation: Chemistry
Prerequisite: CMY 282, CMY 283, CMY 284 and CMY 285
Contact time: 4 lpw 2 ppw 1 dpw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
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 electro-chemistry.

CMY 384 Organic chemistry 384
Academic organisation: Chemistry
Prerequisite: CMY 282, CMY 283, CMY 284 and CMY 285
Contact time: 4 lpw 2 ppw 1 dpw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 18
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).

CMY 385 Inorganic chemistry 385
Academic organisation: Chemistry
Prerequisite: CMY 282, CMY 283, CMY 284 and CMY 285
Contact time: 4 lpw 2 ppw 1 dpw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
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 solvent, special topics.

DAF 200 Animal anatomy and physiology 200
Academic organisation: Animal and Wildlife Sciences
Prerequisite: CMY 127 or TDH
Contact time: 4 lpw 1 ppw
Period of presentation: Year
Language of tuition: English **Credits:** 36

Module content:
General structure and plan of the body of livestock. Types and characteristics of cells and tissues. Body water. Anatomy, physiology and histology of systems: Skin; skeleton; muscles, connective tissue, ligaments, joints; nervous system; sensory organs of sight, sound, smell, touch, taste; circulatory system; respiratory system; endocrinology; male and female reproductive systems; digestive system, gastrointestinal tract, liver, pancreas; kidneys, acid-base balance and homeostasis; lactation; immune system. General species differences.

DAN 310 Animal anatomy 310
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DAF 200
Contact time: 1 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
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.

DFS 311 Animal physiology 311
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DAF 200
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
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.

DFS 320 Growth physiology 320
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DFS 311 and DAN 310
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
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, race, gender, et al.

ENV 101 Introduction to environmental sciences 101
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 8

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.

ENV 301 Human environmental interactions 301
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
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.

EST 121 Aesthetics 121
Academic organisation: Consumer Science
Prerequisite: OBG 111
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 9
Module content:
Presentation techniques: story boards and technical drawings. Presentation techniques using CAD.

EST 320 Aesthetics: Product, consumer and environment 320 *(To be offered from 2015)*
Academic organisation: Consumer Science
Prerequisite: OBG 111
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
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.

FNH 121 Introduction to food, nutrition and health 121
Academic organisation: Food Science
Prerequisite: Natural and Agricultural Sciences students:
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English Credits: 8
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.

FNH 320 Food and nutrition security 320 (cap sel from ARD 480)
Academic organisation: Food Science
Prerequisite: Second-year status
Contact time: 3 lpw
Period of presentation: Quarter 3
Language of tuition: English Credits: 8
Module content:
Global food system and food security, livelihoods and household dynamics, gender issues.

FNH 400 Research project 400
Academic organisation: Food Science
Prerequisite: Third-year status
Contact time: 1 lpw 2ppw
Period of presentation: Semester 1
Language of tuition: English Credits: 40
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.

FNH 420 Advanced food, nutrition and health 420
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Contact time: 1 bpw
Period of presentation: Semester 2
Language of tuition: English Credits: 20
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.

FNH 421 International nutrition 421
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Contact time: 2 dpw
Period of presentation: Semester 2
Language of tuition: English Credits: 20

Module content:
Discussion classes in International Nutrition focus on the most important current nutrition issues affecting populations worldwide. It includes identifying nutrition challenges and trends in both developing and developed countries. The module includes aspects of epidemiology, disease etiology, and consequences of under-nutrition and over-nutrition.

FNH 480 Internship training in public health nutrition
Academic organisation: Human Nutrition
Prerequisite: Third-year status
Contact time: 14 weeks (40 h per week)
Period of presentation: Semester 2
Language of tuition: English Credits: 60
Module content:
- Community service (potentially Hammanskraal)(8 weeks): 40 credits
- Local government/District level (Department of Health) 4 weeks): 20 credits

FPP 451 Chemical and microbiological aspects of food 451
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Contact time: 1 lpw
Period of presentation: Semester 1 or Semester 2
Language of tuition: English **Credits:** 20
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 microorganisms. Intrinsic and extrinsic factors that affect growth and survival of microorganisms. Important microbial groups in food. Microbial spoilage of foods. Determination of microorganisms 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 microorganisms in food production.

FSK 116 Physics 116
Academic organisation: Physics
Contact time: 4 lpw 1 ppw 1 dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

FSK 176 Physics 176
Academic organisation: Physics
Contact time: 4 lpw 1 ppw 1 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

FST 250 Introduction to food science and technology 250
Academic organisation: Food Science
Prerequisite: CMY 117, CMY 127, PHY 131 and WTW 134 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

FST 260 Principles of food processing and preservation 260
Academic organisation: Food Science
Prerequisite: CMY 117, CMY 127, MBY 161, PHY 131 and WTW 134 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1 and Semester 2
Language of tuition: English **Credits:** 12
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.

FST 350 Integrated food science 350
Academic organisation: Food Science
Prerequisite: Second-year status, FST 250 and FST 260 or TDH

Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
Module content:
Literature studies and seminar presentations on topics in food science, nutrition and health.

FST 351 Food chemistry 351
Academic organisation: Food Science
Prerequisite: BCM 251 and BCM 252 and BCM 261 and BCM 262 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

FST 352 Food chemistry 352
Academic organisation: Food Science
Prerequisite: BCM 251 and BCM 252 and BCM 261 and BCM 262 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

FST 353 Food engineering 353
Academic organisation: Food Science
Prerequisite: FST 260 or TDH
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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 (eg membrane technology), pumping, mixing and forming, heating, concentration, drying, extrusion, refrigeration, freezing. Tutorials/practicals: Calculations on mass and energy balances, psychrometry, refrigeration and freezing.

FST 355 Chemistry of food macro- and micronutrients 355
Academic organisation: Food Science
Prerequisite: BCM 251 and BCM 252 and BCM 261 and BCM 262
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2

Language of tuition: English **Credits:** 18
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.

FST 360 Principles of the science and technology of plant foods 360
Academic organisation: Food Science
Prerequisite: FST 250, FST 260, FST 351 and FST 352 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

FST 361 Animal food science 361
Academic organisation: Food Science
Prerequisite: FST 250, FST 260, FST 351 and FST 352 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

FST 362 Advanced animal and plant foods microbiology 362
Academic organisation: Food Science
Prerequisite: FST 250, MBY 251, MBY 261, MBY 262
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
With an integrated focus on animal an 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 and cell destructionand 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-bone 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. Prcticals will include advanced microbial detection and identification methods applied to animal and plant foods as well as the food supply chain.

FST 400 Research methodology and seminar 400
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Contact time: 1 workshop of 5 days in semester 1, 1 day seminar in semester 2
Period of presentation: Year
Language of tuition: English **Credits:** 20
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.

FST 401 Animal food technology 401
Academic organisation: Food Science
Prerequisite: FST 361 or TDH
Contact time: 9 practical sessions 30 discussion classes
Period of presentation: Semester 2
Language of tuition: English **Credits:** 20
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.

FST 402 Advanced plant food science and technology 402
Academic organisation: Food Science
Prerequisite: FST 360 or TDH
Contact time: 5 practical sessions in semester 1, 8 discussion classes in semester 1, 5 discussion classes in semester 2, 3 practical sessions in semester 2
Period of presentation: Year
Language of tuition: English **Credits:** 20
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.

FST 412 Sensory evaluation 412
Academic organisation: Food Science
Prerequisite: FST 260, FST 351 and FST 352 or TDH
Contact time: 12 discussion classes 6 practical sessions
Period of presentation: Semester 1
Language of tuition: English **Credits:** 10
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.

FST 413 Product development and quality management 413
Academic organisation: Food Science
Prerequisite: FST 260 and FST 351 and FST 352 or TDH
Contact time: 6 practical sessions 15 discussion classes
Period of presentation: Semester 1
Language of tuition: English **Credits:** 30
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.

FST 414 Research methodology 414
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Five-day intensive research methodology workshop: Philosophy of research; where to start research – problem statement; role and importance of the literature review; how to formulate hypotheses and objectives; experimental design; the good practical way to do research, including getting the results down; application of statistics to research; writing an honours report/master's dissertation/doctoral thesis; writing a scientific paper; preparing and presenting posters and oral papers.

FST 420 Advanced food science 420
Academic organisation: Food Science
Prerequisite: Third-year status or TDH
Contact time: 12 discussion classes

Period of presentation: Year
Language of tuition: English **Credits:** 20
Module content:
Discussion classes in advanced level food chemistry, food microbiology, food engineering, food processing and nutrition. Problem solving and literature discussion.

FST 463 Research project 463
Academic organisation: Food Science
Prerequisite: Third-year status in Food Science or TDH
Contact time: 1 ppw
Period of presentation: Year
Language of tuition: English **Credits:** 40
Module content:
Planning, execution and reporting of a research project on a selected Food Science and/or Technology subject.

GGY 156 Aspects of human geography 156
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 tpw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 8
Module content:
This module begins by fostering an understanding of human geography. Then follows the political ordering of space; cultural diversity as well as ethnic geography globally and locally; population geography of te 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.

GGY 166 Southern African geomorphology 166
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 8
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 (eg 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.

GGY 252 Process geomorphology 252
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GGY 166 or GLY 155
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 12
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.

GGY 265 Geomorphology of the built environment 265
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw
Period of presentation: Quarter 3
Language of tuition: Double medium **Credits:** 12
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.

GGY 266 City structure, environment and society 266
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
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.

GGY 283 Introductory geographic information systems 283
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
Module content:
*This is a closed module, only available to students studying [BT&RP] (12132022), [BSc(Arch)] (12132002), [BSc(LArch)] (12132004), BSc (Meteorology) (02133312), BSc (Geoinformatics) (02133383), BSc (Environmental Sciences) (02133361), BSc (Earth Sciences) (02133012), BSc (Geography) (02133385), BEd (Further Education and Training) (General) (09133040), BA (01130001) or as approved by the head of department. The content of this module is the same as GIS 221 and students are not allowed to earn credits for both GGY 283 and GIS 221.
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.

GGY 356 Sustainable development 356
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
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.

GGY 361 Environmental geomorphology 361
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GGY 252
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 18
Module content:
*Note: The module is for BSc (Geography), BSc (Environmental Sciences) and BSc (Geology) 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.

GGY 363 Applied geomorphology 363
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GGY 252
Contact time: 4 lpw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 12
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.

GGY 366 Development frameworks 366
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 18
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.

GIS 120 Geoinformatics 120
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GMC 110
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
The importance of geographical data and an overview of geoinformatics. Cartographic analysis to geoinformatics – a historical perspective. Application fields of geoinformatics. Introduction to geographical information systems (GIS): Components, structure and functionality, GIS visualisation and cartography. Data sources and evaluation: fitness for

purpose, factors affecting suitability, quality and uncertainty, sources of analogue and digital data. Map projection choice. Analysis of GIS output.

GIS 220 Geographic data analysis 220
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
The nature of geographical data and measurement. 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.

GIS 221 Geographic information systems introduction 221
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
*The content of this module is the same as GGY 283 and students are not allowed to earn credits for both GGY 283 and GIS 221.
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.

GIS 310 Geographic information systems 310
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GGY 283 or GIS 221
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 24
Module content:
Advanced theory and practice of Geographic Information Systems; GIS applications; design and implementation of GIS applications.

GIS 320 Spatial analysis 320
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GIS 310 or TDH
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
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.

GKD 250 Introductory soil science 250
Academic organisation: Plant Production and Soil Science
Prerequisite: CMY 117 GS or TDH
Contact time: 3 lpw 1 ppw

Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
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.

GKD 320 Soil chemistry 320
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 14
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.

GKD 350 Soil classification and surveying 350
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
A taxonomic system for South Africa. USDA's Soil Taxonomy. Land suitability evaluation. Optimal resource utilisation. 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.

GKD 420 Soil fertility, soil microbiology and plant nutrition 420
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250 GS
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 14
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 module 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.

GLY 155 Introduction to geology 155
Academic organisation: Geology
Prerequisite: Refer to Regulation 1.2: At leat 60% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 16
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.

GLY 161 Historical geology 161
Academic organisation: Geology
Prerequisite: Refer to Regulation 1.2: At leat 60% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 8
Module content:
Principles of stratigraphy and stratigraphic nomenclature; geological dating and international and South African time scales; Africa framework and tectonic elements of South Africa; introduction to depositional environments. Overview of the historical geology of South Africa, from the Archaean to the present: major stratigraphic units, intrusions and tectonicmetamorphic events – their rock types, fossil contents, genesis and economic commodities. Principles of palaeontology and short description of major fossil groups: fossil forms, ecology and geological meaning. Geological maps and profiles; rock samples.

GLY 162 Environmental and hazard geology 162
Academic organisation: Geology
Prerequisite: Refer to Regulation 1.2: At leat 60% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 8
Module content:
Hazardous exogenic and endogenic geological processes and their influence on the human environment; impact of human activities on the geological environment; natural resource utilisation including materials for construction; natural and mine-induced seismicity; waste disposal; groundwater and environmental pollution. Geological maps; geological profiles; rock specimens; fossil specimens.

GLY 253 Sedimentology 253
Academic organisation: Geology
Prerequisite: CMY 117, GLY 155 and **1 of** GLY 161, GLY 162 and WTW 114/WTW 158 or PHY 114
Contact time: 4 lpw 2 ppw

Period of presentation: Quarter 3
Language of tuition: English **Credits:** 12
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.

GLY 254 Structural geology 254
Academic organisation: Geology
Prerequisite: CMY117, GLY 155 and **1 of** GLY 161, GLY 162 and WTW 114 or WTW 158 or PHY 114
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 12
Module content:
Integrated theoretical and practical course dealing with the principles 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 zones, progressive deformation. Stereographic projection and structural analysis.

GLY 255 Fundamental and applied mineralogy 255
Academic organisation: Geology
Prerequisite: CMY 117, GLY 155 and 1 of GLY 161, GLY 162 and WTW 114/WTW 158 or PHY 114
Contact time: 4 lpw 2 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 24
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.

GLY 261 Igneous petrology 261
Academic organisation: Geology
Prerequisite: GLY 255 or TDH
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 12
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.

GLY 262 Metamorphic petrology 262
Academic organisation: Geology
Prerequisite: GLY 255 or TDH
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 12
Module content:
Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments.

GLY 265 Groundwater 265
Academic organisation: Geology
Prerequisite: GLY 155 and **1 of** GLY 161, GLY 162 and WTW 114/WTW 158 and WTW 128/WTW 168 or PHY 114
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 12
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. Groundwater flow modelling; classification of aquifers in southern Africa; groundwater exploration and management. Mapping techniques.

GLY 361 Ore deposits 361
Academic organisation: Geology
Prerequisite: Five of the second-year modules: GLY 253, GLY 254, GLY 255, GLY 261, GLY 262, GLY 265
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
Module content:
Systematic review of major metallic and non-metallic ore types and examples in South Africa and world-wide; ore type models (grades, tonnages); geometry of ore bodies; mining. Ore samples and ore mineralogy. Mapping techniques.

GLY 362 Geostatistics and ore reserve calculations 362
Academic organisation: Geology
Prerequisite: GLY 253, GLY 254, GLY 255, GLY 261, GLY 262, GLY 265
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
Module content:
Review of classical geostatistical methods; problem evaluation; descriptive statistics, normal, lognormal, three parameter lognormal distributions; confidence intervals; t-test. Sampling; cut-off values; grid generation and trend surface analysis. Semivariogram; error estimation; Kriging (BLUE) techniques. Ore reserve calculations.

GLY 363 Engineering geology 363
Academic organisation: Geology
Prerequisite: GLY 155 and GLY 265 and 4 of the second-year modules: GLY 253, GLY 254, GLY 255, GLY 261, GLY 262
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 18
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.

GLY 364 Rock mechanics 364
Academic organisation: Geology
Prerequisite: GLY 254 and 4 of the second-year modules: GLY 255, GLY 253, GLY 261, GLY 262, GLY 265
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 18
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.

GMA 220 Remote sensing 220
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 16
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 include examining the basic physics of electromagnetic radiation and the complex interactions of radiation with the surface and atmosphere (ie 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.

GMA 320 Remote sensing 320
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GMA 220 or TDH
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
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.

GMC 110 Cartography 110
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
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).

GMC 310 Geometrical and space geodesy 310
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GMC 110 and WTW 114
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 24
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.

GMT 320 Geoinformatics project 320
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: GIS 310 and INF 214 and INF 261 or TDH. Only for Geoinformatics students.
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
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.

GTS 161 Introductory genetics 161
Academic organisation: Genetics
Prerequisite: MLB111 GS
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8

Module content:
Chromosomes and cell division. Principles of Mendelian inheritance: locus and alleles, dominance interactions and epistasis. Probability studies. Sex determination and sex linked traits. Pedigree analysis. Extranuclear inheritance. Genetic linkage and chromosome mapping. Chromosome variation.

GTS 251 Molecular genetics 251
Academic organisation: Genetics
Prerequisite: GTS161 GS
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
Module content:
Chemical nature of DNA. Replication transcription, RNA processing and translation. Control of gene expression in prokaryotes and eukaryotes. Recombinant DNA technology and its applications in gene analysis and manipulation.

GTS 261 Genetic variation and evolution 261
Academic organisation: Genetics
Prerequisite: GTS251 GS
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
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.

GTS 351 Eukaryotic gene control and development 351
Academic organisation: Genetics
Prerequisite: GTS 251 GS and GTS 261 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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 embyonic development and differentiation, cancer and other diseases in humans.

GTS 354 Genome evolution and phylogenetics 354
Academic organisation: Genetics
Prerequisite: GTS 251 GS and GTS 261 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
Module content:
Mechanisms involved in the evolution of genomes. Comparison of the molecular organisation of viral, archaea, eubacterial and eukaryotic genomes. Genome project

design, DNA sequencing methods and annotation. Molecular evolution Phylogenetic inference methods. Applications of phylogenetics and contemporary genome research.

GTS 367 Population and evolutionary genetics 367
Academic organisation: Genetics
Prerequisite: GTS 251 and GTS 261 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
Genetic and phenotypic variation. Organisation of genetic variation. Random genetic drift. Mutation and the neutral theory. Darinian selection. Inbreeding, population subdivision and migration. Evolutionary quantative genetics. Population genomics. Human population genetics. Levels of selection and individuality. Arms races and irreversibility. Complexity, Applied evolution.

GTS 368 Genetics in human health 368
Academic organisation: Genetics
Prerequisite: GTS 251 and GTS 261 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
Application of modern genetics to human variability, health and disease. Molecular origin of Mendelian and multifactoral diseases. The use of polymorphisms, gene mapping, linkage and association studies in medical genetics. Congenital abnormalities, risk assessment and genetic consultation. Prenatal testing, population screening, treatment of genetic diseases and gene-based therapy. Parmacogentics and cancer genetics. Ethical aspects in medical genetics.

GVK 420 Large stock science 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: RPL 320, VGE 301 and VKU 210
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
Industrial science and management of large stock. Revision of the principles of agricultural management. Aspects of business management of the large stock enterprise. Management programmes, production systems and techniques applicable to beef cattle, dairy cattle and horses. Design and planning of farm buildings and structures. Storage and handling of fodder. The handling and management of refuse. Hygiene and herd health programmes.

HSC 351 Nursery management: Principles and practices 351
Academic organisation: Plant Production and Soil Science
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
The organised nursery industry in South Africa. Principles of seed production and 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, economical and marketing aspects of a typical nursery operation. Students will get hands-on experience and visit nurseries.

HSC 420 Fruit tree crops 420
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250 and PGW 350
Contact time: 4 lpw 1ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 26
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 fertilisation, irrigation, pest and disease complex, tree and fruit manipulation, physiological disorders of economically important tropical, subtropical and temperate fruit crops produced in Southern Africa.

HSC 490 Ornamental horticulture 490
Academic organisation: Plant Production and Soil Science
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
Economic importance of cut flowers and pot plants. 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 land-scape use. Climatic, reproduction and maintenance requirements for trees, palms, shrubs, flowering plants, groundcovers, 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.

IAS 211 Actuarial mathematics 211
Academic organisation: Insurance and Actuarial Science
Prerequisite: Both WTW 114 and WTW 128 60%
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Accumulation functions, interest, time value of money, compounding periods, cashflow models, equations of value, annuities certain, continuous time application, life tables, derivation of contingent probabilities from life tables, contingent payments, loan schedules, performance measurement, valuation of fixed interest securities.

IAS 221 Actuarial mathematics 221
Academic organisation: Insurance and Actuarial Science
Prerequisite: IAS 211 GS #
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2

Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Fundamentals of survival models, simple laws of mortality, expectation of life, elementary survival contracts, communication functions, select and ultimate life tables, advanced life annuities, accumulation and discounting, life insurance, net and gross premiums, reserves, statistical considerations.

IAS 282 Financial mathematics 282
Academic organisation: Insurance and Actuarial Science
Prerequisite: IAS 211 70% or TDH
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
Generalised cash-flow model. The time value of money. Interest rates. Discounting and accumulating. Compound interest functions. Equations of value. Loan schedules. Project appraisal. Investments. Simple compound interest problems. The "No Arbitrage" assumption and forward contracts. Term structure of interest rates. Stochastic interest rate models.

IAS 361 Insurance and actuarial applications 361
Academic organisation: Insurance and Actuarial Science
Prerequisite: IAS 211 and IAS 221
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

IAS 382 Actuarial modelling 382
Academic organisation: Insurance and Actuarial Science
Prerequisite: IAS 282
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 20
Module content:
Principles of actuarial modelling and stochastic processes. Markov chains and continuous-time Markov jump processes. Simulation of stochastic processes. Survival models and the life table. Estimating the lifetime distribution Fx(t). The Cox regression model. The two-state Markov model. The general Markov model. Binomial and Poisson models. Graduation and statistical tests. Methods of graduation. Exposed to risk. The evaluation of assurances and annuities. Premiums and reserves.

INB 320 Interior planning 320
Academic organisation: Consumer Science
Prerequisite: ITW 311 and OBG 111
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 11

Module content:
The planning and arrangement of existing living and working spaces to provide for the various needs of the individual, family or group. Evaluation of floor plans; arrangement of furniture.

INB 322 Interior planning 322
Academic organisation: Consumer Science
Prerequisite: ERG 282, ITW 311 and OBG 111
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 11
Module content:
The planning and designing of living and working spaces to provide for the different needs of the client. Visual and oral presentations for clients.

INB 410 Interior planning 410
Academic organisation: Consumer Science
Prerequisite: CIL 122 and INB 322
Contact time: 1 lpw 2 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 23
Module content:
Advanced interior planning.

INK 310 Interior production 310
Academic organisation: Consumer Science
Prerequisite: INK 210
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 11
Module content:
A study of fashion and market trends in interior textile products. Development of a sample file. Exposure to mass production of selected interior products.

IPO 380 Interior experiential training 380
Academic organisation: Consumer Science
Prerequisite: INK 310 and ITW 311
Contact time: 1 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
Module content:
Controlled experiential training. During the third year of study, during holidays, weekends and after hours, students must complete a total of 120 hours experiential training in the industry to develop practical and occupational skills. This is equal to 3 weeks x 40 hours (120 hours), according to requirements as determined by the head of department. This exposure must be successfully completed, together with a final report, before the degree will be conferred.

ITP 481 Project: Interior merchandise 481
Academic organisation: Consumer Science
Prerequisite: Final-year status, INB 322, SEM 381 GS and INB 410 #
Contact time: 1 lpw 1 ppw

Period of presentation: Year
Language of tuition: Double medium **Credits:** 28
Module content:
Project to illustrate the ability to integrate relevant theory in the planning and presentation of an interior merchandise project for specific clients.

ITW 311 Interior merchandise 311
Academic organisation: Consumer Science
Prerequisite: ITW 121
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 11
Module content:
A study of furniture (case goods and upholstered), floor coverings, wall finishes, lighting and household textile products in terms of construction techniques, composition, properties, quality indicators, advantages and disadvantages, appearance, durability, cost and maintenance and care factors.

KLD 210 Costume and fashion history 210
Academic organisation: Consumer Science
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
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.

KLD 222 Fashion forecasting 222
Academic organisation: Consumer Science
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
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.

KLD 311 Social and cultural aspects of clothing 311*(To be offered from 2015)*
Academic organisation: Consumer Science
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 15
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.

KLD 322 Social and cultural aspects of clothing 322
Academic organisation: Consumer Science
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 20
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.

KLD 410 Clothing retail management 410
Academic organisation: Consumer Science
Prerequisite: Fourth-year status
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 20
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.

KLD 420 Clothing merchandising 420
Academic organisation: Consumer Science
Prerequisite: Fourth-year status
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 20
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.

KLR 110 Clothing production: Sewing techniques 110
Academic organisation: Consumer Science
Contact time: 1 lpw 1 ppw 1 dpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 9
Module content:
Basic clothing construction techniques and quality control.

KLR 120 Clothing production: Processes 120
Academic organisation: Consumer Science
Prerequisite: KLR 110
Contact time: 1 lpw 1 ppw 1 dpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 9
Module content:
Application of basic clothing construction techniques and quality control.

KLR 211 Flat pattern design 211
Academic organisation: Consumer Science
Prerequisite: KLR 120
Contact time: 2 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
Flat pattern design. Computer-aided Design (CAD).

KLR 221 Pattern use and good fit 221
Academic organisation: Consumer Science
Prerequisite: KLR 211
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 10
Module content:
Pattern use and good fitting.

KLR 311 Tailoring 311
Academic organisation: Consumer Science
Prerequisite: KLR 211 and KLR 221
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 11
Module content:
Tailoring.

KLR 321 Clothing production 321
Academic organisation: Consumer Science
Prerequisite: KLR 221
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 11
Module content:
Small-scale production: Industrial machines, production systems, quality assurance.

KLR 411 Product development 411
Academic organisation: Consumer Science
Prerequisite: KLR 221 and KLR 321
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 19

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.

KTP 220 Experiential training 220
Academic organisation: Consumer Science
Contact time: 1 ppw 1 dpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 4
Module content:
Compulsory practical training in the clothing industry during the year, approved in consultation with the head of the department.

KTP 402 Clothing textile project 402
Academic organisation: Consumer Science
Prerequisite: Fourth-year status and BEM 314
Contact time: 1 ppw 1 dpw
Period of presentation: Year
Language of tuition: Double medium **Credits:** 28
Module content:
Project in field of application: planning and execution.

KTP 403 Experiential training in industry 403 *(To be offered from 2016)*
Academic organisation: Consumer Science
Prerequisite: Documentation of work experience as required for years 1 to 3
Contact time: 1 ppw 1dpw
Period of presentation: Year
Language of instruction: Double medium **Credits:** 28
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 must be successfully completed together with a complete portfolio before the degree will be conferred.

KVK 420 Small stock science 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: RPL 320, VGE 301 and VKU 220
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
Module content:
Small stock management, shearing organisation, 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.

LBU 260 Agroclimatology 260
Academic organisation: Plant Production and Soil Science
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
*This module may only be taken by students enrolled for a BScAgric programme
Climate in southern Africa. Irradiation and energy balance. Hydrological cycle with special reference to downpour and evaporation from vegetative surfaces. Windbreaks and frost control. Influence of climate on farming systems. Instrumentation and measurement of downpour, evaporation, radiation, temperature, humidity and wind.

LEK 210 Introduction to agricultural economics 210
Academic organisation: Agricultural Economics, Extension and Rural Development
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
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.

LEK 220 Agricultural economics 220
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: [LEK 210] or [EKN 113 and EKN 120]
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
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.

LEK 310 Agricultural economics 310
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: [LEK 210 or EKN 110] and [EKN 120]
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12

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.

LEK 320 Agricultural economics 320
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: LEK 210 and LEK 220
Contact time: 3 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
The modern food and agribusiness system: Key drivers in the global context. Whole farm planning and budjet 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. Vaalue chains in agribusiness. Risk management. Strategic management and marketing principles in agribusiness. Operational management and human resources management. Business planning for agribusiness.

LEK 410 Agricultural market and price analysis 410
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: LEK 210, LEK 220 and STK 281
Contact time: 3 lpw 2 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 24
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.

LEK 415 Agricultural economics 415
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: EKN 110, LEK 220 and WTW 134
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 18
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.

LEK 421 Agricultural economics 421
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: LEK 410, STK 210 and STK 281
Contact time: 3 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 24
Module content:
Price and production function analysis. Input-output, input-input and product-product relationships; profit maximisation; the production process through time, economies of size; decision making in agriculture under risk and uncertain circumstances; linear programming.

LEK 424 Introduction to resource economics 424
Academic organisation: Agricultural Economics, Extension and Rural Development
Prerequisite: LEK 210
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 15
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.

LKM 450 Environmental biophysics 450
Academic organisation: Plant Production and Soil Science
Prerequisite: WTW 134
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

LST 133 Language, life and study skills 133
Academic organisation: Natural and Agricultural Sciences Dean's Office
Prerequisite: As for Four-year programmes
Contact time: 1 lpw 3 dpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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.

LST 143 Language, life and study skills 133
Academic organisation: Natural and Agricultural Sciences Dean's Office
Prerequisite: LST 133
Contact time: 1 lpw 3 dpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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 andhow 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.

MBY 161 Introduction to microbiology 161
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MLB 111 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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.

MBY 251 Bacteriology 251
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY 161 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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, methano-genesis. 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.

MBY 261 Mycology 261
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY 161
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
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.

MBY 262 Food microbiology 262
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY 251
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
Primary sources of microorganisms in food. Factors affecting the growth and survival of micro-organisms 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.

MBY 351 Virology 351
Academic organisation: Microbiology and Plant Pathology
Prerequisite: BCM 251 and CMY 127 and MBY 161
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

MBY 355 Bacterial genetics 355
Academic organisation: Microbiology and Plant Pathology
Prerequisite: BCM 251 and CMY 127 and MBY 161
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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, translation and post-translational levels. Global regulation and compartmentalisation.

MBY 364 Genetic manipulation of microbes 364
Academic organisation: Microbiology and Plant Pathology
Prerequisite: BCM 251 and CMY 127 and MBY 161
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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. Characterisation (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.

MBY 365 Microbe interactions 365
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY251, MBY261 and MBY351
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

MLB 111 Molecular and cell biology 111
Academic organisation: Genetics
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics 50% in the Grade 12 examination
Contact time: 4 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Introductory study of the ultra structure, function and composition of representative cells and cell components. General principles of cell metabolism, molecular genetics, cell growth, cell division and differentiation.

MLB 133 Molecular and cell biology 133
Academic organisation: Plant Science
Prerequisite: As for BSc (Four-year programme)
Contact time: 2 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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.

MLB 143 Molecular and cell biology 143
Academic organisation: Plant Science
Prerequisite: MLB 133
Contact time: 2 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
Module content:
Chemistry of the cell, introduction to the structure, function and composition of prokaryotic and eukaryotic cells, energy and cellular metabolism, photosynthesis.

MLB 153 Molecular and cell biology 153
Academic organisation: Genetics
Prerequisite: MLB 143
Contact time: 2 lpw 2 ppw 2 tpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Cell growth and cell division, Mendelian and human genetics, principles of molecular genetics, principles of recombinant DNA technology and its application.

OBG 111 Design principles 111
Academic organisation: Consumer Science
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 7
Module content:
An introduction to the elements and principles of design as is applicable to interior and clothing design and food preparation. Colour theory.

OKW 413 Weed science 413
Academic organisation: Plant Production and Soil Science
Prerequisite: PLG 251
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 14
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.

OPI 400 Experiential training in industry 400 *(To be offered from 2016)*
Academic organisation: Consumer Science
Prerequisite: Documentation of work experience as required for years 1 to 3
Contact time: 1 ppw
Period of presentation: Year
Language of instruction: Double Medium **Credits: 28**

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 to include event management, according to requirements as determined by the head of department. These credits 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 VDS414 & VDS 424, VDS413 and FST 413 and take place after hours to develop practical and industry skills.

OPI 480 Experiential training in industry 480
Academic organisation: Consumer Science
Contact time: 1 dpw
Period of presentation: Year
Language of tuition: Double medium **Credits:** 6
Module content:
Experiential training in the industry: During the four 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

PGB 410 Project: Research methodology 410
Academic organisation: Consumer Science
Prerequisite: Final-year status
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 10
Module content:
Research methodology. Planning, executing and reporting a research project in hospitality management.

PGB 420 Project: Hospitality management 420
Academic organisation: Consumer Science
Prerequisite: PGB 410 and Final-year status
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 20
Module content:
Research methodology. Planning, executing and reporting a research project in Hospitality Management.

PGW 350 Soil-water relationship and irrigation 350
Academic organisation: Plant Production and Soil Science
Prerequisite: GKD 250
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

PGW 400 Seminar 400
Academic organisation: Plant Production and Soil Science
Contact time: 1 lpw 3 spw
Period of presentation: Year
Language of tuition: Both Afr and Eng **Credits:** 20
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.

PGW 421 Experimental design and analysis 421
Academic organisation: Plant Production and Soil Science
Prerequisite: BME 120
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
Basic experimental designs. Measurement and control over experimental error. Factorial experiments and interactions. Analysis of variance (ANOVA) and data interpretation.

PHY 114 First course in physics 114
Academic organisation: Physics
Prerequisite: Refer to Regulation 1.2: At least 60% for Mathematics and Physical Science in the Grade 12 examination
Contact time: 4lpw 1ppw 1bpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

PHY 124 First course in physics 124
Academic organisation: Physics
Prerequisite: WTW 114 GS and PHY 114 GS
Contact time: 4lpw 1ppw 1 bpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16

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.

PHY 131 Physics for Biology students 131
Academic organisation: Physics
Prerequisite: Mathematics 50% Grade 12
Contact time: 4lpw 1ppw 1dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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, radioactivity.

PHY 133 Physics 133
Academic organisation: Physics
Prerequisite: As for BSc (Four-year programme)
Contact time: 2 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Heat: temperature and scales, the kinetic molecular model, work, energy and heat, calorimetry, specific heat, expansion, heat transfer. Measurements: SI-units, measuring error and uncertainty, (graphs), significant figures, mathematical modelling. Geometrical optics: reflection, refraction, dispersion, mirrors, thin lenses, instruments.

PHY 141 General physics 141
Academic organisation: Physics
Prerequisite: PHY 131 GS as well as 50% minimum for the practical component of PHY 131 or TDH
Contact time: 1 lpw 2 tpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 16
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.

PHY 143 Physics 143
Academic organisation: Physics
Prerequisite: PHY 133
Contact time: 2 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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.

PHY 144 Physics 144
Academic organisation: Physics
Prerequisite: PHY 133
Contact time: 2 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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 center 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.

PHY 153 Physics 153
Academic organisation: Physics
Prerequisite: PHY 143
Contact time: 3 lpw 2 ppw 2 dpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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; sounds, intensity, superposition, interference, standing waves, resonance, beats, Doppler effect. Physical optics: Young-interference, coherence, thin layers, diffraction, gratings, polarisation.

PHY 154 Physics 154
Academic organisation: Physics
Prerequisite: PHY 143
Contact time: 4 lpw 1 ppw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
The main topics in this module are 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.

PHY 163 General physics 163
Academic organisation: Physics
Prerequisite: PHY 153

Contact time: 4 lpw 1 ppw d tpw Foundation Course
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
Module content:
*This module corresponds with the module PHY 124. The four modules PHY 133, PHY 143, PHY 153 and PHY 163 are equivalent to PHY 114 and PHY 124.
Simple harmonic motion and pendulums. Coulomb's law. Electric field: dipole, Gauss' law. Potential. Capacitance. Electric currents: resistance, resistivity, Ohm's law, energy, power, semiconductors, superconductors, emf, RC-circuits. Magnetism: Hall effect, Biot-Savart law. Faraday's and Lenz's laws. LR-circuits. Alternating current: RLC-circuits, power transformers. Modern physics: Theory of special relativity, wave/particle nature, photoelectric effect, matter waves, quantum theory, infinite potential well, hydrogen atom and spectra, nuclear physics, Rutherford model, nucleons.

PHY 255 Waves, thermodynamics and modern physics 255
Academic organisation: Physics
Prerequisite: [PHY114 & PHY124] or [PHY171] or [PHY143 & PHY153 & PHY163] and [WTW211#] and [WTW218#]
Contact time: 4 lpw 1 ppw 2 dpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 24
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.

PHY 263 General physics 263
Academic organisation: Physics
Prerequisite: PHY 255 GS and WTW 218 GS and WTW 220 # and WTW 248 #
Contact time: 4 lpw 1 ppw 2 dpw

Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
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. Matrial strength.
Phase diagrammes. Ceramics. Polymers. Composites. Fracture. Electrical and magnetic properties. Semiconductors. Smart materials Nanotechnology.
Experiments (14 sessions)

PHY 353 Physics project 353
Academic organisation: Physics
Prerequisite: TDH
Contact time: 3 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
Module content:
*Cannot be used as substitute for other Physics 300 modules to obtain admission to the BScHons 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.

PHY 356 Electronics, electromagnetism and quantum mechanics 356
Academic organisation: Physics
Prerequisite: PHY 255 GS and PHY 263 GS and WTW 211 GS and WTW 218 GS and WTW 220 GS and WTW 248 GS
Contact time: 4 lpw 2 ppw 2 dpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 36
Module content:
Electronics (14 lectures)
Thévenin and Norton equivalent circuits, superposition principle, RC, LC and LRC circuits. Semiconductor diode. Bipolar transitor. 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 wavefunction, 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, eigenfunctions of a Hermitian operator, Dirac notation, the Schrödinger equation in spherical coordinates, the hydrogen atom, angular momentum spin.

PHY 363 Physics project 363
Academic organisation: Physics
Prerequisite: TDH
Contact time: 3 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
*PHY 363 cannot be used as substitute for other Physics 300 modules to obtain admission to the BScHons 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.

PHY 364 Statistical mechanics, solid state physics and modelling 364
Academic organisation: Physics
Prerequisite: PHY 356 GS and WTW 211 and WTW 218 and WTW 220 GS and WTW 248 GS
Contact time: 4 lpw 2 ppw 2 dpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 36
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 subdisciplines of Physics.

PLG 251 Introduction to crop protection 251
Academic organisation: Microbiology and Plant Pathology
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12

Module content:
Development and importance of crop protection. Basic principles in crop protection ie epidemic development of disease and insect pest populations, ecology of plant diseases and abiotic factors that affect plant health ie 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.

PLG 262 Principles of plant pathology 262
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY 161
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
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.

PLG 351 General plant pathology 351
Academic organisation: Microbiology and Plant Pathology
Prerequisite: MBY 161, MBY 261 and PLG 262
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

PLG 363 Plant disease control 363
Academic organisation: Microbiology and Plant Pathology
Prerequisite: PLG 251 or PLG 262 or TDH. MBY 261 is recommended
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
Principles of plant disease control. Non-chemical control including biological control, disease resistance, regulatory measures, cultivation practices, physical methods. Modern chemotherapy: characteristics, mode of action and application of fungicides, bactericides and nematicides. Principles of integrated disease management.

PLG 462 Research project 462
Academic organisation: Microbiology and Plant Pathology
Contact time: 1 lpw 1 ppw
Period of presentation: Year
Language of tuition: Double medium **Credits:** 30
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.

PLG 463 Plant disease epidemiology 463
Academic organisation: Microbiology and Plant Pathology
Prerequisite: PLG 251, PLG 262 and PLG 363
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

PLG 483 Advanced plant disease control 483
Academic organisation: Microbiology and Plant Pathology
Prerequisite: PLG 363 or TDH
Contact time: 1 ppw 2 dpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
Module content:
Advanced aspects of chemical and biological control of plant diseases as well as disease resistance.

PLG 490 Current concepts in plant pathology 490
Academic organisation: Microbiology and Plant Pathology
Prerequisite: Third-year status or TDH
Contact time: 2 lpw 1 dpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
This module will address the most recent concepts in plant pathology.

PPK 251 Sustainable production systems 251
Academic organisation: Plant Production and Soil Science
Prerequisite: BOT 161
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Sustainability in plant production. Principles and practices of monoculture, crop rotation, ley cropping and intercropping systems. Organic farming. Precision farming. Concepts such as target yield, maximum economic yield and the farming systems approach. Principles of soil cultivation and conservation.

PVK 420 Poultry science 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301 and VKU 220
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
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.

RPL 310 Reproduction science 310
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DAF 200
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
Theriogenology, spermatogenesis, zoogenesis, the female sexual cycle. Species differences. Hormonal control of the sexual functions.

RPL 320 Reproduction science 320
Academic organisation: Animal and Wildlife Sciences
Prerequisite: RPL 310
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
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 fertilisation. Handling of apparatus and practical insemination, oestrus observation and determination of gestation.

SCI 154 Exploring the universe 154
Academic organisation: Physics
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 16
Module content:
The content of this module is the same as SCI 164 and students are not allowed to register for both SCI 154 and SCI 164.
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? Echo's 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.

SCI 164 Exploring the universe 164
Academic organisation: Physics
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Afrikaans **Credits:** 16
Module content:
*This module is presented in Afrikaans only. See SCI 154 for a summary of the module content. The content of this module is the same as SCI 154 and students are not allowed

to register for both SCI 154 and SCI 164.
Studente uit alle fakulteite is welkom om saam met ons die heelal vanuit 'n aardgebonde perspektief te verken. Ons besin oor die ganse kosmos van die submikroskopiese tot die asemrowende, uitgestrekte makroskopiese en die mens se beskeie posisie daarin. Tot watter mate bepaal sterre ons lewensgeluk? Eggo's van antieke uitspansels – die sterrekunde van vervloeë beskawings. Die heelal word gebore met 'n knal. Sterre, die Melkweg en planete word gevorm. Lewe word in die aardse landskap geplaas, maar is daar lewe elders? Die argitektuur van die heelal – afstandmetings, struktuur van ons sonnestelsel en sterrestelsels. Hoe lyk ons buurplanete? Komete en meteoriete. Lewenssiklusse van sterre. Ontploffende sterre. Eksotiese voorwerpe soos pulsare en swart gate.

SEM 381 Seminar 381
Academic organisation: Consumer Science
Prerequisite: Third-year status
Contact time: 1 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 5
Module content:
Introduction to research methodology.

SGM 210 Geomaterials and processes 210
Academic organisation: Geology
Contact time: 4 lpw 3 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Solar system; Earth structure and systems; plate tectonics; classification and contextual setting of rocks and minerals; rock cycle. Internal and external geological processes; landscape formation; influences of geological environment on mankind. Geological time and the Earth's history through time. Practicals involving identification and description of crystals, minerals and rocks.

SUR 210 Surveying 210
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 3 lpw 4 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16
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.

SUR 220 Surveying 220
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: WTW 114 GS
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 16
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.

TKS 212 Textiles: Utility, fibres and yarns 212
Academic organisation: Consumer Science
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 14
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).

TKS 222 Textiles: Structures and finishes 222
Academic organisation: Consumer Science
Prerequisite: TKS 212 GS
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 10
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.

TKS 310 New developments and textiles in use 310
Academic organisation: Consumer Science
Prerequisite: TKS 212 and TKS 222 GS
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 10
Module content:
New developments (apparel textiles). Textile product use. Impact of textiles on ecology and sustainability.

TKS 411 New developments, sustainability and textiles in use 411 *(To be offered from 2016)*
Academic organisation: Consumer Science
Prerequisite: TKS 212 and TKS 222
Contact time: 2 lpw 1ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 13
Module content:
New developments (apparel textiles). Textile product use and basic physical quality testing procedures. Impact of textiles on the environment and sustainability.

TKS 421 Textiles: marketing and consumer aspects 421
Academic organisation: Consumer Science
Prerequisite: TKS 212, TKS 222 and TKS 310
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 15
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.

TLR 320 Animal breeding 320
Academic organisation: Animal and Wildlife Sciences
Prerequisite: GTS 261
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
Karyotyping of farm animals; breed and species 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.

TLR 411 Animal breeding 411
Academic organisation: Animal and Wildlife Sciences
Prerequisite: TLR 320 and simultaneously register for GVK 420, PVK420, KVK420 and VKD 410
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

TLR 420 Animal breeding 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: TLR 411
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
Formulation and application of breeding objectives. Animal recording systems and international guidelines for evaluation. Species-specific breeding systems. Breeding objectives and selection programmes for beef and dairy cattle, small stock, poultry, pigs and companion animals. Selection of traits of economic importance and the efficiency thereof. Cross-breeding systems in meat-producing farm animals. Breed development.

TRN 213 Site surveying 213
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

VBF 411 Consumer facilitation 411
Academic organisation: Consumer Science
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 10
Module content:
Consumer decision making through the family life cycle; determinants of consumer satisfaction. Consumer education; development of consumer skills; less privileged consumers. Expenditure patterns of the diverse South African consumer market. Consumerism. Globalisation.

VDB 321 Food service management 321
Academic organisation: Consumer Science
Prerequisite: Natural and Agricultural Sciences students: VDS 322 #
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
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.

VDB 410 Food service management 410
Academic organisation: Consumer Science
Prerequisite: VDB 321 GS
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 24
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. Marketing of food services.

VDB 420 Food service management 420 *(To be offered from 2016)*
Academic organisation: Consumer Science
Prerequisite: VDB 320 and VDB 321 GS
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 21

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. Marketing of food services.

VDG 250 Nutrition 250
Academic organisation: Animal and Wildlife Sciences
Prerequisite: Natural and Agricultural Sciences students: CMY 127
Health Sciences students: second year status
Contact time: 3 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

VDG 260 Nutrition 260
Academic organisation: Animal and Wildlife Sciences
Prerequisite: CMY 127
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
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.

VDG 311 Nutrition 311
Academic organisation: Consumer Science
Prerequisite: [FSG 110 and FSG 120] or VDG 220
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 17
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.

VDG 321 Nutrition during life cycle 321
Academic organisation: Consumer Science
Prerequisite: VDG 311
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 17

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.

VDS 111 Basic food preparation 111
Academic organisation: Consumer Science
Contact time: 1 lpw 1 ppw 1 dpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 6
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 food service industry and contemporary chefs. Basic food quality control.
Module 2: Food preparation basics of the following: stocks, soups and sauces.

VDS 121 Basic food preparation 121
Academic organisation: Consumer Science
Prerequisite: VDS 111
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 6
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.

VDS 210 Food commodities and preparation 210
Academic organisation: Consumer Science
Prerequisite: VDS 121
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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: 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.

VDS 221 Food commodities and preparation 221
Academic organisation: Consumer Science
Prerequisite: VDS 210
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18

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.

VDS 310 Consumer food research 310
Academic organisation: Consumer Science
Prerequisite: VDS 221
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 21
Module content:
Planning, executing and reporting consumer food research. Food preservation and evaluation techniques. Experiments in food, emphasising 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.

VDS 322 Large-scale food production and restaurant management 322
Academic organisation: Consumer Science
Prerequisite: VDS 210 and VDS 221
Contact time: 3 lpw 3 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 31
Module content:
Module 1 and practical work: Principles of large-scale food preparation and the practical application thereof in a restaurant situation. Restaurant management. 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.
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.

VDS 354 Food safety and hygiene 354
Academic organisation: Consumer Science
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 14
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, sterilisation and control of microbes; techniques of microbial repression: sterilisation 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.

VDS 354 Food safety and hygiene 354
Academic organisation: Consumer Science/Food Science
Contact time: 2 lpw 0.5 ppw
Period of presentation: Semester 2
Language of instruction: English **Credits:**12
Module content:
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, sterilisation and control of microbes; techniques of microbial repression: sterilisation by using heat, radiation, filtration, chemicals decimation of numbers.
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.

VDS 355 Food and beverage service management 355
Academic organisation: Consumer Science
Prerequisite: VDS 221
Contact time: 2 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: Double medium **Credits:** 6
Module content:
Table setting, table serving, wine service, food and wine pairing, beverage management.

VDS 413 Recipe development and standardisation 413
Academic organisation: Consumer Science
Prerequisite: VDS 310 or VDS 322
Contact time: 3 lpw 2 ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 30
Module content:
Recipe development process. Development of appropriate recipes and food products for a given situation. Standardisation of recipes. Food styling and food photography.

VDS 414 Culinary art 414
Academic organisation: Consumer Science
Prerequisite: VDS 210 and VDS 221
Contact time: 2 lpw 1 ppw 1 bpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 28
Module content:
Advanced food preparation and presentation techniques.

VDS 415 Visual merchandising of foods 415
Academic organisation: Consumer Science
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 15
Module content:
Aspects of food retailing with special emphasis on food packaging and labelling of food products. Aspects of food retailing with regard to display, presentation and shop layout as applied to food products.

VDS 417 Consumer aspects of food 417 *(To be offered from 2016)*
Academic organisation: Consumer Science
Prerequisite: BEM 212 [for module 2] and Final-year status
Contact time: 3 lpw
Period of presentation: Semester 1
Language of instruction: Double medium **Credits:** 15
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.

VDS 423 Foods 423
Academic organisation: Consumer Science
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 15
Module content:
Factors influencing food consumption, consumer behaviour and food choice. Food product advice. Consumer advice, marketing of food products, consumer education.

VDS 424 Culinary art 424
Academic organisation: Consumer Science
Prerequisite: VDS 221, VDS 322 # and VDS 414
Contact time 2 lpw 1 ppw
eriod of presentation: Semester 2
Language of tuition: Double medium **Credits:** 19
Module content:
Advanced food preparation and presentation techniques. Event planning and banqueting.

VDS 425 Project: Foods visual merchandising of foods 425
Academic organisation: Consumer Science
Prerequisite: VDS 415 and VDS 423
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 15
Module content:
Practical application of the principles in visual merchandising of food and food retailing in the food industry.

VDS 426 Food research project 426
Academic organisation: Consumer Science
Prerequisite: PGB 410 # and VDS 310
Contact time: 1 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
Planning, executing and reporting a research project in a food-related field.

VDS 427 Food retailing and visual merchandising of food 427 (*To be offered from 2016*)
Academic organisation: Consumer Science
Prerequisite: VDS 417 and Final-year status
Contact time: 1 lpw; 1 ppw
Period of presentation: Semester 2
Language of instruction: Double medium **Credits:** 17
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.

VGE 301 Nutrition science 301
Academic organisation: Animal and Wildlife Sciences
Prerequisite: BCM 261 and BCM 262 and DAF 200 and VDG 260 and VKU 220 or VKU 260
Contact time: 3 lpw fortnightly practicals
Period of presentation: Year
Language of tuition: Both Afr and Eng **Credits:** 32
Module content:
Digestion and metabolism of feeds. The division of food energy and food energy systems. Protein quality and requirements. Mineral and vitamin requirements. Nutritional standards. Voluntary intake. Characteristics of fodder. Rumen function and microbial fermentation. Practical work: In vivo and in vitro digestibility studies.

VGE 411 Nutrition science 411
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301
Contact time: 4 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Dubbelmedium **Credits:** 18
Module content:
Specialised nutrition of monogastric animals: poultry, pigs, horses and selected freshwater aquatic organisms. The use of computer systems in feeding management.

VGE 421 Nutrition science 421
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301
Contact time: 3 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: English **Credits:** 16
Module content:
Specialised small stock and game nutrition. Nutrition of rams, ewes and lambs for optimal

production. Principles of creep feeding, drought feeding, winter and supplementary feeding. Feeding pen nutrition and final nutritional preparation of lambs. Influence of nutrition on wood, pelts and Mohair. Fodder flow planning. Practical work: Formulation of lowest cost rations and practical work with ruminants.

VGE 423 Nutrition science 423
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16
Module content:
Specialised nutrition of beef and dairy cattle according to production systems. The use of computer systems in feeding management. The practicals will include compiling rations in terms of requirements and least cost formulations, specialised assignments and on-farm experiential training.

VKD 410 Pig science 410
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301, VKU 220
Contact time: 1 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
Module content:
Industrial science and management of pigs – sow, boar and growing pigs. Production systems and feeding systems. Design and utilisation of housing facilities. Product quality and marketing. Hygiene and herd health programmes.

VKF 411 Animal science pharmacology 411
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DFS 320 and VGE 301
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 12
Module content:
The pharmacology, laws, control and use of substances for animal production.

VKU 120 Animal science 120
Academic organisation: Animal and Wildlife Sciences
Contact time: 2 lpw 0.5ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
Module content:
Origin and domestication of farm and companion animals. The ecological environment in which animal production and development is practised. Livestock species, breeds and breed characterisation and genetic variation. Terminology. Practical work includes identification and classification of different breeds of livestock.

VKU 122 Animal nutrition 122
Academic organisation: Animal and Wildlife Sciences
Contact time: 2 lpw
Period of presentation: Semester 2

Language of tuition: English **Credits:** 6
Module content:
The chemical composition of fodder. Digestive processes and the digestibility of fodder. The nutrition and nutritional requirements of farm stock. Basic composition of rations. Intensive and extensive feeding.

VKU 210 Animal science 210
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VKU 120 GS of TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 8
Module content:
Basic principles of nutrition, physiology, breeding and production. Applied principles of livestock production, production management and systems (large livestock, small stock, pigs and poultry). Organisation of the livestock industry and relevant legislation. Animal handling.
Practical work includes the general care and handling of farm stock.

VKU 220 Animal science 220
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VKU 210 GS or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 12
Module content:
Livestock ecology, interaction between genotype and environment. Production regions and systems. Animal ecological factors that influence regional classification. Animal ecological factors to be considered in production factors, planning and management of different livestock production systems. Conservation farming and adapted farming and management systems; environmental conservation. Practical work will consist of compulsory farm practical during vacation after the 1st year and or during the 2nd year of study.

VKU 250 Animal science 250
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VKU 120 GS or TDH
Contact time: 2 lpw 1ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
Introduction to the basic principles and terminology of large stock, small stock, pig and poultry production systems.

VKU 260 Livestock ecology 260
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VKU 250 GS or TDH
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
Livestock ecology, interaction between genotype and environment. Production regions

and systems. Animal ecological factors that influence regional classification. Animal ecological factors to be considered in production factors, planning and management of different livestock production systems. Conservation farming and adapted farming and management systems; environmental conservation. Practical work will consist of compulsory farm practical during vacation after the 1st year and or during the 2nd year of study.

VKU 320 Animal science 320
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VKU 210, VKU 220 and WDE 310
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
Module content:
Functional management of intensive and extensive beef, dairy, sheep and goat production systems. Discussions and literature studies on applied animal nutrition, breeding production planning and production processes.

VKU 361 Animal ecology 361
Academic organisation: Animal and Wildlife Sciences
Prerequisite: TDH
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
Module content:
Animal ecology, interaction between genotype and environment. Animal ecological factors which influence regional classification. Animal ecological factors which must be taken into consideration in the obtaining of the production factors, planning and management of the cattle farming enterprise. Conservation farming and adapted farming and management systems; environmental conservation.

VKU 362 Animal science biotechnology 362
Academic organisation: Animal and Wildlife Sciences
Prerequisite: GTS 261
Contact time: 1 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 8
Module content:
Application of biotechnology in farm animals with specific reference to reproductive biotechnology such as AI MOET and sex manipulation, which has an effect on genetic progress. Application of DNA technology such as parentage verifications, identification of genetic defects, QTL's and MAS.

VKU 400 Research methodology 400
Academic organisation: Animal and Wildlife Sciences
Prerequisite: Simultaneously register for GVK 420, PVK 420, TLR 411, VGE 423, VKF 411
Contact time: 2 lpw 1 spw
Period of presentation: Year
Language of tuition: English **Credits:** 16
Module content:
Research methodology in animal science: Literature studies and seminars. Introduction to

the problem, approach to problem solving, methodology and appropriate reporting. Practice.

VNP 480 Food research project 480 (*To be offered from 2016*)
Academic organisation: Consumer Science
Prerequisite: BEM 314 / FST 414 and Final-year status
Contact time: 1 lpw; 1 ppw
Period of presentation: Year
Language of instruction: Double medium **Credits: 28**
Module content:
Research methodology. Planning, executing and reporting a research project in Food Management/Hospitality Management/Food Retail Management.

VSX 420 Meat and dairy science 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: DFS 320
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 10
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.

VVW 350 Community nutrition and public health 350
Academic organisation: Human Nutrition
Prerequisite: HNT 210 or TDH and VDG 250 or VDG 260 and VDG 321
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 21
Module content:
Theory and practice of community nutrition and public health (capita selecta CNT 411). Environmental health issues and health indicators in communities.

VVW 363 Food, nutrition and health 363
Academic organisation: Consumer Science
Prerequisite: BCM 251 and BCM 252 and BCM 261 and BCM 262 and VDG 311and VDG 321
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 21
Module content:
Scientific foundation of food and nutrition in health promotion and disease prevention. Principles of interpretation of nutritional assessment data.

VVW 364 Food composition and applied nutritional programmes 364
Academic organisation: Food Science
Prerequisite: FST 351 and FST 352 or TDH
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18

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 labelling of food. Use of nutritional data in food formulations. Dietary supplementation, enrichment and fortification of foods.

WDE 253 Basic principles of pasture science 253
Academic organisation: Plant Production and Soil Science
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
Module content:
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.

WDE 310 Principles of veld management 310
Academic organisation: Plant Production and Soil Science
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 14
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 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.

WDE 320 Planted pastures and fodder crops 320
Academic organisation: Plant Production and Soil Science
Prerequisite: WDE 310
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 14
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 utilisation 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.

WDE 450 Environmental resource assessment and management 450
Academic organisation: Plant Production and Soil Science
Contact time: 3 lpw fortnightly practicals
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 20

Module content:
Determining the 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 etc which 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.

WKD 155 Atmospheric structure and processes 155
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 16
Module content:
Weather and climate. Origin and composition of the atmosphere. Oqygen, carbon and life. Meteorological instruments. Temperature distribution and heat capacity. Atmospheric mass and pressur. Zenith angle of sun. Sunshine variability. The boundary layer and heat transfer. Atmospheric heat budget. Urban and rural climates. Phases of water and latent heat. Moisture in the atmosphere. Cloud development. Sensible heat. Comfort zones. Hadley and Walker (ENSO) cells. Polar stratospheric ozone. Climate and climate change. Radiation. Electromagnetic spectrum. Planck's constant. Radiation energy. Irradiance and radiance. Albedo. Black body radiation. Global energy balance.

WKD 164 Climate and weather of Southern Africa 164
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 8
Module content:
The climate of Southern Africa. Synoptic weather systems of Southern Africa. Classification of weather types. Synoptic and METAR messages. Weather data on the internet. Introduction to satellite images and synoptic charts.

WKD 261 Physical meteorology 261
Academic organisation: Geography, Geoinformatics and Meteorology
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 14
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. Basic cloud model programming in Fortran.

WKD 263 Introduction to dynamic meteorology 263
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: WKD 261 and WTW 218 or TDH
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 14

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 numerical temperature advection model.

WKD 352 Atmospheric vorticity and divergence 352
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: WTW 248
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
Module content:
Scale analyses and simplification of the basic equations. The geostrophic, thermal and gradient wind. The vorticity equation and divergence.

WKD 356 Climate and community 356
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: : Limited to students enrolled for BSC (Meteorology), BSc (Geography), BSc (Geoinformatics), BSc (Environmental Sciences) or BA own choice with major in Geography
Contact time: 4 lpw 1 dpw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
Module content:
Atmospheric sciences and greenhouse gases, climate change, impacts of climate change on communities. Identification of vulnerability of communities. Adaptation and mitigation to climate change. Outreach to community.

WKD 361 Quasi-geostrophic analysis 361
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: WKD 352 GS #
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 20
Module content:
Tendency and Omega equations. Model of a boroclinic system. Introduction to numerical models. Application in meteorology display and analysis software.

WKD 366 Fundamentals of weater forecasting 366
Academic organisation: Geography, Geoinformatics and Meteorology
Prerequisite: WKD 261 GS
Contact time: 4 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 36
Module content:
Metereorological observations, data, codes. Weather applications software systems and computing environments for meterological analysis and weather forecasting techniques. Applications of remote sensing in weather forecasting. Aaerological diagrams Applications of numerical weather prediction, and types of weather forecasts. Integration

of information to describe the current state of the atmosphere and to predict a future state of the atmosphere.

WKE 420 Wildlife science 420
Academic organisation: Animal and Wildlife Sciences
Prerequisite: VGE 301 and VKU 361 or TDH
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 10
Module content:
Introductory aspects of wildlife conservation, habitat management, wildlife nutrition and keeping wildlife in zoological gardens.

WST 111 Mathematical statistics 111
Academic organisation: Statistics
Prerequisite: At least 5 (60-69%) in Mathematics in the Grade 12 examination
Contact time: 1 ppw 4 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

WST 121 Mathematical statistics 121
Academic organisation: Statistics
Prerequisite: WST 111 GS or WST 133, 143 and 153
Contact time: 1 ppw 4 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

WST 133 Mathematical statistics 133
Academic organisation: Statistics
Prerequisite: BSc and BCom numeric stream students: At least 3 (40-49%) in Mathematics in the Grade 12 examination and must be taken concurrently with WTW133, or
BCom non-numeric stream students: At least 3 (40-49%) in Mathematics in the Grade 12 examination and must be taken concurrently with WTW183.
Contact time: 1 ppw 1 bpw 4 lpw Foundation course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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).
Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

WST 143 Mathematical statistics 143
Academic organisation: Statistics
Prerequisite BSc and BCom numeric stream students: WTW 133 and WST 133 and must be taken concurrently with WTW 143, or
BCom non-numeric stream students: WTW 183 and WST133.
Contact time: 1 ppw 1 dpw 4 lpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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:
Differentiation. Applications of differentation 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.
Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

WST 153 Mathematical statistics 153
Academic organisation: Statistics
Prerequisite: WST 133 and WST 143 and WTW 143. Must be taken concurrently with WTW 153
Contact time: 1 ppw 1 dpw 4 lpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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.

WST 211 Mathematical statistics 211
Academic organisation: Statistics
Prerequisite: WST 111, WST 121, WTW 114 GS, WTW 126 GS and WTW 128 GS
Contact time: 2 ppw 4 lpw
Period of presentation: Semester 1

Language of tuition: Double medium **Credits:** 24
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 distibutions: 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.

WST 221 Mathematical statistics 221
Academic organisation: Statistics
Prerequisite: WST 211 GS
Contact time: 2 ppw 4 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 24
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.

WST 311 Multivariate analysis 311
Academic organisation: Statistics
Prerequisite: WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
Module content:
Multivariate statistical distributions: Moments of a distribution, moment generating functions, independence. Multivariate normal distribution: Conditional distributions, partial and multiple correlations. Multinomial and multivariate Poisson distributions: Asymptotic normality and estimation of parameters. 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 and sample correlation coefficients. The linear model: Models of full rank, least squares estimators, test of hypotheses. Practical applications: Practical statistical modelling and analysis using statistical computer packages and interpretation of the output.

WST 312 Stochastic processes 312
Academic organisation: Statistics
Prerequisite: WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

WST 321 Time-series analysis 321
Academic organisation: Statistics
Prerequisite: WST 211, WST 221, WST 311 GS, WTW 211 GS and WTW 218 GS
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
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.

WST 322 Actuarial statistics 322
Academic organisation: Statistics
Prerequisite: WST 211, WST 221, WTW 211 GS and WTW 218 GS
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
Decision theory. Loss distributions. Reinsurance. Risk models. Ruin theory. Credibility theory. Methods to forecast future claim numbers and amounts. The generalised linear model: Exponential family, mean and variance, link functions, deviance and residual analysis, test statistics, log-linear and logit models. Practical statistical modelling and analysis using statistical computer packages.

WTW 114 Calculus 114
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2. Mathematics 60% Grade 12
Contact time: 4 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

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.

WTW 115 Discrete structures 115
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
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.

WTW 123 Numerical analysis 123
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 GS
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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.

WTW 126 Linear algebra 126
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 60% for Mathematics in the Grade 12 examination
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 211).
Vector algebra with applications, matrix algebra, systems of linear equations, the vector space Rn, bases, determinants. Mathematical induction. Complex numbers and factorisation of polynomials.

WTW 128 Calculus 128
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 GS
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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).
Applications of integration. The formal definition of a limit. The fundamental theorem of Calculus and applications. Parametric and polar equations. Vector functions of one variable, quadratic curves. Introduction to functions of several variables and partial derivatives.

WTW 133 Precalculus 133
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: As for BSc (Four-year programme)
Contact time: 3 lpw 1 ppw 1 tpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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.

WTW 134 Mathematics 134
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 tpw
Period of presentation: Semester 1 or Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
*Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 114, WTW 158. WTW 134 does not lead to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 134 can also be taken in the second semester.
Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration, matrics, solutions of systems of equations. All topics are studied in the context of applications.

WTW 143 Calculus 143
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 133
Contact time: 3 lpw 1 tpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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.

WTW 144: Mathematics 144
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 133
Contact time: 3 lpw 1 tpw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
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. Differentation: Formulas and rules, applications, extremes of a function. All topics are studied in the context of applications.

WTW 152 Mathematical modelling 152
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 50% for Mathematics in the Grade 12 examination
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
Introduction to the modelling of dynamical processes using difference equations. Curve fitting. Introduction to linear programming. Matlab programming. Applications to real-life situations in, among others, finance, economics and ecology.

WTW 153 Calculus 153
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 143
Contact time: 4 lpw 1 ppw 1 tpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Rigorous treatment of limits and continuity. 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.

WTW 154: Mathematics 154
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 144
Contact time: 4 lpw 1 ppw 1 tpw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
Integration: Accumulated change, the definite integral, antiderivates, the defintе integral

as an area, interptretations 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.

WTW 158 Calculus 158
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 60% for Mathematics in the Grade 12 examination
Contact time: 4 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.
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.

WTW 161 Linear algebra 161
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: Refer to Regulation 1.2: At least 60% for Mathematics in the Grade 12 examination
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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 161, WTW 126.
Vector algebra with applications, matrix algebra, systems of linear equations, the vector space R~~n~~, bases, determinants. Mathematical induction. Complex numbers and factorisation of polynomials. Conic sections. This module also includes a formal technique mastering programme.

WTW 162 Dynamical processes 162
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 GS
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8
Module content:
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.

WTW 168 Calculus 168
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 GS or WTW 158 GS
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8

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 168, WTW 128, WTW 138.
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.

WTW 211 Linear algebra 211
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 126
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
This is an introduction to linear algebra on R~~n~~. Matrices and linear equations, linear combinations and spans, linear independence, subspaces, basis and dimension, eigen-values, eigenvectors, similarity and diagonalisation of matrices, linear transformations.

WTW 218 Calculus 218
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114, WTW 126 and WTW 128
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Calculus of multivariable functions, directional derivatives. Extrema and Lagrange multipliers. Multiple integrals, polar, cylindrical and spherical coordinates.

WTW 220 Analysis 220
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 and WTW 128
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
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.

WTW 221 Linear algebra 221
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 211
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Abstract vector spaces, change of basis, matrix representation of linear transformations, orthogonality, diagonalisability of symmetric matrices, some applications.

WTW 238 Mathematics 238
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 256 and WTW 258 GS
Contact time: 4 lpw 2 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

WTW 248 Vector analysis 248
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 218
Contact time: 2 lpw 1 dpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
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.

WTW 256 Differential equations 256
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 158, WTW 161 and WTW 168
Contact time: 2 lpw 1tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
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.

WTW 258 Calculus 258
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 158 and WTW 168
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 8
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.

WTW 263 Numerical methods 263
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 161 and WTW 168
Contact time: 2 lpw 1 tpw

Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
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.

WTW 264 Differential equations 264
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114, WTW 126 and WTW 128
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 12
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. Numerical methods applied to nonlinear systems. The Laplace transorm.

WTW 285 Discrete structures 285
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 115
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
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.

WTW 286 Differential equations 286
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114, WTW 126, WTW 128 and WTW 162
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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. Qualitative analysis of linear systems.

WTW 310 Analysis 310
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 220
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18

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.

WTW 320 Analysis 320
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 218 and WTW 310
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
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.

WTW 354 Financial engineering 354
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WST 211, WTW 211 and WTW 218
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

WTW 364 Financial engineering 364
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WST 211, WTW 126, WTW 218 and WTW 286 or WTW 264
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

WTW 381 Algebra 381
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114 and WTW 211
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

WTW 382 Dynamical systems 382
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 218 and WTW 286 or WTW 264
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

WTW 383 Numerical analysis 383
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 114, WTW 128 and WTW 211
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
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.

WTW 386 Partial differential equations 386
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 248 and WTW 286 or WTW 264
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

WTW 387 Continuum mechanics 387
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 248 and WTW 286 or WTW 264
Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
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.

WTW 389 Geometry 389
Academic organisation: Mathematics and Applied Mathematics
Prerequisite: WTW 211

Contact time: 2 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
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.

ZEN 161 Animal diversity 161
Academic organisation: Zoology and Entomology
Prerequisite: MLB 111 GS or TDH
Contact time: 2 lpw fortnightly practicals
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 8
Module content:
Animal classification, phylogeny, organisation 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.

ZEN 251 Invertebrate biology 251
Academic organisation: Zoology and Entomology
Prerequisite: ZEN 161 GS or TDH
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 12
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.

ZEN 261 African vertebrates 261
Academic organisation: Zoology and Entomology
Prerequisite: ZEN 161 GS or TDH
Contact time: 4 lpw 1 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 12
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.

ZEN 351 Population ecology 351
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18

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.

ZEN 352 Mammalogy 352
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
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.

ZEN 353 Community ecology 353
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
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 patterns and mechanisms.

ZEN 354 Physiology 354
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 2
Language of tuition: English **Credits:** 18
Module content:
The module is designed to promote understanding of animals as integrated systems at every level of organisation. The module focuses on the function of tissues, organs and organ systems of multicellular organisms in chemical and physical terms. Animal physiology is the study of how a living animal functions.
This module adopts a systems-based approach that covers many of the subdisciplines of physiology, ranging from neural physiology and endocrinology to mechanoreception and osmoregulation.

ZEN 355 Insect diversity 355
Academic organisation: Zoology and Entomology
Prerequisite: ZEN 251 GS or TDH
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 1
Language of tuition: English **Credits:** 18
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 lifestyles and habitats.

ZEN 361 Ecophysiology 361
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 18
Module content:
The costs of living; factors affecting metabolic rate; limitations to the acquisition of energy and nutrients; the principles of nutritional ecology; problems associated with herbivorous diets; the effects of temperature on whole organism processes and the response of species to temperature variation; ectothermic and endothermic temperature regulation; animal responses to high and low temperatures; water balance physiology of insects and vertebrates; osmoregulation in aquatic and terrestrial environments; the importance of physiological ecology for understanding geographic variation in body size, range size, and abundance.

ZEN 362 Evolution and phylogeny 362
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 3
Language of tuition: English **Credits:** 18
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.

ZEN 363 Behavioural ecology 363
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 18
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.

ZEN 364 Conservation ecology 364
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4

Language of tuition: English **Credits:** 18
Module content:
This module is intended to provide students with skills to undertake field surveys that are essential for research and planning in the conservation of biodiversity. The module has a large fieldwork component. A field trip will be conducted over a ten-day period during the September vacation in the Sani Pass region of the Drakensberg (including South Africa and Lesotho).
The students will be actively involved in planning and executing the field surveys, and will be responsible for analysing and presenting the results. The students will gain valuable practical experience in the field by applying a number of survey techniques and focusing on several different taxa that are relevant to conservation ecology.

ZEN 365 Applied entomology 365
Academic organisation: Zoology and Entomology
Contact time: 4 lpw 2 ppw
Period of presentation: Quarter 4
Language of tuition: English **Credits:** 18
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 crops 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. Lectures will be complemented by practical experiences that provide students with skills in the design, conduct, analysis, interpretation and reporting of applied entomological research.

Alphabetical list of modules offered by the Faculty of Engineering, Built Environment and Information Technology

AIM 101 Academic information management 101
Academic organisation: School of Information Technology
Contact time: 2 lpw
Period of presentation: Semester 1 or Semester 2
Language of tuition: Both Afr and Eng **Credits:** 6
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.

AIM 111 Academic information management 111
Academic organisation: School of Information Technology
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 4
Module content:
Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.

AIM 121 Academic information management 121
Academic organisation: School of Information Technology
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 4
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.

COS 132 Imperative programming 132
Academic organisation: Computer Science
Prerequisite: APS of 30 and Grade 12 Mathematics level 5 (60-69%)
Contact time: 1 ppw 1 tpw 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
*Note: All students registered for degrees within the School of IT, excluding the two four-year programmes, BIS (Information Science) and BIS (Publishing), need to enrol for this module.
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 userfriendly interfaces. Students should be able to conduct basic program analysis and write complete elementary programs.

COS 133 Introduction to programming 1 133
Academic organisation: Computer Science
Prerequisite: Extended programmes only
Contact time: 2 dpw 2 lpw 2 ppw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
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 and arrays.

COS 143 Introduction to programming 2 143
Academic organisation: Computer Science
Prerequisite: COS 133
Contact time: 2 dpw 2 lpw 2 ppw Foundation Course
Period of presentation: Semester 2
Language of tuition: English **Credits:** 8

Module content:
This module follows on from the previous module and introduces the concepts of functions, memory management and libraries in the imperative programming paradigm. An introduction to object orientation will be given. After completing this module and the module prerequisite, 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.

COS 153 Introduction to programming 3 153
Academic organisation: Computer Science
Prerequisite: COS 143
Contact time: 2 dpw 2 lpw 2 ppw Foundation Course
Period of presentation: Semester 1
Language of tuition: English **Credits:** 8
Module content:
The module follows a practical programming approach. It will consolidate fundamental prior problem solving and programming knowledge.

SGM 311 Soil mechanics 311
Academic organisation: Civil Engineering
Prerequisite: (SWK 210)
Contact time: 1 tpw 2 ppw 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

SWK 122 Mechanics 122
Academic organisation: Civil Engineering
Prerequisite: WTW 158
Contact time: 2 tpw 4 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

SWK 210 Strength of materials 210
Academic organisation: Civil Engineering
Prerequisite: SWK 122, WTW 168/WTW 128
Contact time: 2 tpw 4 lpw
Period of presentation: Semester 1

Language of tuition: Both Afr and Eng **Credits:** 16
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 υ. Design of beams from section characteristics. Deflection of beams: The elastic curve, integration method, Macaulay's method and superposition.

Alphabetical list of modules offered by the Faculty of Health Sciences

ANA 121 Introduction: Human anatomy and embryology 121
Academic organisation: Anatomy
Prerequisite: MLB111 and CMY117
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 4
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.

ANA 122 Human osteology 122
Academic organisation: Anatomy
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 4
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.

ANA 126 Basic human histology 126
Academic organisation: Anatomy
Prerequisite: CMY 117 and MLB 111
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 4
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.

ANA 214 Human cell and developmental biology 214
Academic organisation: Anatomy
Prerequisite: ANA 121 and ANA 126 and CMY 127
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

ANA 215 Paleoanthropology 215
Academic organisation: Anatomy
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

ANA 247 Human anatomy part 1
Academic organisation: Anatomy
Prerequisite: ANA 121 and ANA 122 and CMY 127
Contact time: 2 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 16
Module content:
Regional approach to human anatomy.
Cadaver dissection of the upper and lower limbs, back, thorax, abdomen, pelvis, perineum and genital area. Anatomical techniques.
NOTE: This module is not open to all students and may only be taken by BSc (Medical Sciences) students.

ANA 226 Human histology 226
Academic organisation: Anatomy
Prerequisite: ANA 126#
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
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.

ANA 315 Forensic anthropology 315
Academic organisation: Anatomy
Prerequisite: ANA 122, ANA 215
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

ANA 316 Cell and tissue techniques 316
Academic organisation: Anatomy
Prerequisite: ANA 226
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18
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.

ANA 324 Human cell and developmental biology 324
Academic organisation: Anatomy
Prerequisite: ANA 214, ANA 226
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

ANA 328 Applied research techniques 328
Academic organisation: Anatomy
Prerequisite: ANA 315#, ANA 316#
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 2

Language of tuition: English **Credits:** 8
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.

ANA 347 Human anatomy part 2 347
Academic organisation: Anatomy
Prerequisite: ANA 217GS
Contact time: 2 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.

CNT 310 Community nutrition 310
Academic organisation: Human Nutrition
Prerequisite: Second-year status or TDH
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
Module content:
Community nutrition practice within the larger public health realm. Nutrition within primary health care. Nutrition and community development as well as project planning and management.

CNT 320 Community Nutrition 320
Academic organisation: Human Nutrition
Prerequisite: Second-year status or TDH
Contact time: 1 dpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 3
Module content:
A project on community profiling and primary health care nutrition services in South Africa.

DTT 222 Nutrition education 222
Academic organisation: Human Nutrition
Prerequisite: Second-year status or TDH
Contact time: 2 lpw 1ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
The application of communication principles in nutrition instruction.
Theoretical frameworks, knowledge and skills, planning and evaluation of content; teaching aids.

FAR 381 Pharmacology 381
Academic organisation: Pharmacology
Prerequisite: FLG 211, FLG 212, FLG 221, FLG 222 GS

Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 18
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.

FAR 382 Pharmacology 382
Academic organisation: Pharmacology
Prerequisite: FAR 381, FLG 211, FLG 212, FLG 221, FLG 222 GS
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 18
Module content:
Hormones, drugs that act on the histaminergic, serotonergic, and dopaminergic receptors. Pharmacotherapy of diabetes mellitus, schizophrenia, depression, obesity, anxiety, insomnia, gastrointestinal diseases. Anticoagulants, antimicrobial drugs.

FLG 211 Introductory and neurophysiology 211
Academic organisation: Physiology
Prerequisite: CMY 117, CMY 127, MLB 111 and PHY 131
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
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.

FLG 212 Circulatory physiology 212
Academic organisation: Physiology
Prerequisite: CMY 117, CMY 127, MLB 111 and PHY 131
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 12
Module content:
Body fluids; haematology; cardiovascular physiology and the lymphatic system. Practical work: Practical exercises to complement the theory.

FLG 221 Lung and renal physiology, acid-base balance and temperature 221
Academic organisation: Physiology
Prerequisite: FLG 211, FLG 212
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
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.

FLG 222 Digestion, endocrinology and reproductive systems 222
Academic organisation: Physiology
Prerequisite: FLG 211, FLG 212
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 12
Module content:
Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems. Practical work: Practical exercises to complement the theory.

FLG 311 Applied cellular physiology 311
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 14
Module content:
This module comprises studies of the cell cycle, signal transduction pathways involved, cell cycle defects and mutations, cellular radiosensitivity and the physiological role, morphological properties and biochemical mechanisms of apoptosis and autophagy.
Practical work: Exposure to applied cellular and in-vitro cell culture techniques.

FLG 312 Developmental physiology 312
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 9
Module content:
Study of the physiological development and adaptations from the foetus through to the aged.

FLG 313 Research methodology and literature studies 313
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 dpw 1 lpw 1 ppw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 14
Module content:
Research methodology, career planning, subject orientated literature studies and seminars. Practical work: Preparation of research protocol, gathering of information (literature), writing of seminar.

FLG 314 Immunology 314
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw
Period of presentation: Semester 1

Language of tuition: English **Credits:** 9
Module content:
Introduction to basic, applied and integrated immunological mechanisms.

FLG 322 Industrial physiology 322
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
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.
*This module is reserved for students who intend studying the honours degree in occupational health and safety.

FLG 324 Exercise physiology 324
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 14
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.

FLG 325 Nutrition physiology 325
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 9
Module content:
The importance of nutrients and micro nutrients in the composition of a normal diet; the neuro-endocrine control of food intake and special aspects of function control of the digestive tract.

FLG 327 Higher neurological functions 327
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 2lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 18
Module content:
Overview of higher cognitive functions and the relationship between psyche, brain and immune system.

FLG 328 Pathophysiology 328
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 9
Module content:
Human patho and applied physiology.

FLG 329 Integrated human physiology 329
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 1 ppw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 9
Module content:
Integration of all the human physiological systems.

FLG 330 Cellular and developmental physiology 330 *(To be offered from 2015)*
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 1
Language of instruction: English **Credits:** 18
Module content:
This module comprises of studies of cell cycle regulation and signal transduction upon induction of growth or types of cell death. Study of the physiological development and adaptations from the foetus through to the aged. Practical work: Exposure to applied cellular and in *vitro* cell culture techniques.

FLG 331 Exercise and nutrition science 331 *(To be offered from 2015)*
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of instruction: English **Credits: 18**
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.

FLG 332 Applied and pathophysiology 332 *(To be offered from 2015)*
Academic organisation: Physiology
Prerequisite: BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
Contact time: 2 lpw 1 ppw
Period of presentation: Semester 2
Language of instruction: English **Credits: 18**

Module content:
Integration of all the human physiological systems.
Practical work: Applied practical work.

FSG 110 Physiology 110
Academic organisation: Physiology
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 6
Module content:
Introduction (terminology and anatomical orientation); chemical principles; cytology and histology; neuro-physiology and the senses; haematology and body fluids; cardio-vascular system.

FSG 120 Physiology 120
Academic organisation: Physiology
Prerequisite: FSG 110
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 6
Module content:
Respiratory system; nutrition; digestion and metabolism; kidneys and acid-base equilibrium; endocrinology; reproduction physiology and reproduction; skin and body temperatures.

HNT 210 Human Nutrition 210
Academic organisation: Human Nutrition
Prerequisite: Second-year status
Contact time: 1 lpw 1ppw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 27
Module content:
Application of scientific principles in human nutrition.
Standards, guidelines and food composition tables.

HNT 220 Human Nutrition 220
Academic organisation: Human Nutrition
Prerequisite: FLG 211 GS FLG 212 GS BCM 253 BCM 254 BCM 255 BCM 256 VDG 250 HNT 210
Contact time: 3 lpw 1dpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 24
Module content:
Human nutrition in the life cycle: Nutritional screening, nutritional needs, nutrition problems and prevention thereof, growth monitoring and meal/menu planning.

HNT 411 Advanced Human Nutrition 411
Academic organisation: Human Nutrition
Prerequisite: Fourth-year status or TDH
Contact time: Discussion classes
Period of presentation: Semester 1
Language of tuition: English **Credits:** 18

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.

MRZ 310 Ethics and law in health care 310
Academic organisation: Physiotherapy
Prerequisite: Third-year status or TDH
Contact time: 10 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 6
Module content:
Definition of health care ethic: person and quality of life, morality vs ethics, rights vs duties, values vs virtues, South African Bill of Human Rights, autonomy, beneficence and non-maleficence, justice, honesty, truthfulness, trust, confidentiality and privacy, informed consent, negligence, malpractice. Health care codes, oaths and declarations, South African Health Rights, Patient Charter. Ethical decision-making.

NTA 313 Nutritional assesment 313
Academic organisation: Human Nutrition
Prerequisite: Third-year status or TDH
Contact time: 4 lpw 1dpw
Period of presentation: Semester 1
Language of tuition: Dubbelmedium **Credits:** 46
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.

RCH 310 Research Project 310
Academic organisation: Human Nutrition
Prerequisite: Third-year status or TDH
Contact time: 2 lpw 1 dpw
Period of presentation: Semester 1
Language of tuition: English Credits: 20
Module content:
Research methods and process.

RCH 320 Research Project 320
Academic organisation: Human Nutrition
Prerequisite: Third-year status or TDH
Contact time: 1 lpw 1dpw
Period of presentation: Semester 2
Language of tuition: Dubbelmedium Credits: 10
Module content:
Literature study, protocol and statistics (1 l + 1 x 2h discussion).
Preparation of protocol and submission for approval (1 x 2h discussion).

RCH 410 Research Project 410
Academic organisation: Human Nutrition
Prerequisite: Third-year status or TDH
Contact time: 1 pww
Period of presentation: Semester 1
Language of tuition: English Credits: 7
Module content:
Execution of and reporting on a research project

Alphabetical list of modules offered by the Faculty of Economic and Management Sciences

BDO 181 Industrial and organisational psychology 181
Academic organisation: Human Resource Management
Contact time: 3 lpw
Period of presentation: Quarter 2
Language of tuition: Both Afr and Eng **Credits:** 5
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.

BEL 220 Taxation 220
Academic organisation: Taxation
Prerequisite: FRK 111, FRK 121 or FRK 100 or FRK 101
Contact time: 3 lpw 1dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Introduction to income taxation, gross income, gross income (special inclusions), exempt income, general deduction formula, special deductions for individuals, capital allowances, introduction to fringe benefits, provisional taxation and employees' taxation.

BEM 110 Marketing management 110
Academic organisation: Marketing Management
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
Principles of marketing management and marketing instruments, customer centricity, the process of marketing management, market segmentation, positioning and marketing information systems, environmental analysis, identification of target markets, value creation, positioning strategies, consumer behaviour, relationship marketing, relationship intention, application of product, price, marketing communication and distribution strategies.

BEM 122 Marketing applications 122
Academic organisation: Marketing Management
Prerequisite: BEM 110 GS
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
E-marketing, services marketing, not-for-profit marketing, business-to-business marketing, retailing, global marketing.

BEM 211 Marketing management 211
Academic organisation: Marketing Management
Prerequisite: BEM 110 or BEM 121/122 with a GS in the other
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16
Module content:
Product decisions
Problem statement and concept determination of product decisions, management strategies of the organisation, organisational and product strategy, implementation of the product strategy, product and market development strategy and the product life cycle.
Distribution decisions
The development and management of distribution channels – strategic aims, conventional marketing systems, the main role players, the integration of distribution with the other marketing instruments and relationship marketing; the influence of the external environment on channel design and management; the management of horizontal and vertical marketing systems and the forming of strategic alliances.

BEM 212 Consumer behaviour 212
Academic organisation: Marketing and Communication Management
Prerequisite: BEM 110 GS
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Internal and external influencing factors of consumer behaviour, the consumer's decision process and application fields of consumer behaviour, consumerism and social responsibility, buying behavjour 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.

BEM 221 Marketing mangement 221
Academic organisation: Marketing Management
Prerequisite: BEM 110 or BEM 121/122 with a GS in the other, BEM 211 GS
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Product decisions
Problem statement and concept determination of product decisions, management strategies of the organisation, organisational and product strategy, implementation of the

product strategy, product and market development strategy and the product life cycle.
Distribution decisions
The development and management of distribution channels – strategic aims, conventional marketing systems, the main role players, the integration of distribution with the other marketing instruments and relationship marketing; the influence of the external environment on channel design and management; the management of horizontal and vertical marketing systems and the forming of strategic alliances.

BEM 224 Integrated brand communication 224
Academic organisation: Marketing Management
Prerequisite: BEM 110 GS
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

BEM 314 Marketing research 314
Academic organisation: Marketing Management
Prerequisite: BEM 110; BEM 212 and STK 110
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 20
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.

BEM 321 Marketing management 321
Academic organisation: Marketing Management
Prerequisite: BEM 212
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 20
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.

BME 120 Biometry 120
Academic organisation: Statistics
Prerequisite: At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123
Contact time: 1 ppw 4 lpw
Period of presentation: Semester 2

Language of tuition: Both Afr and Eng **Credits:** 16
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 hypothesis testing in the one- and two-sample cases (parametric and non-parametric). Multi-sample inference: One- and two-way analysis of variance (designs). Categorical data analysis: Testing goodness of fit and contingency tables. Simple linear regression and correlation analyses. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.

BME 210 Biometry 210
Academic organisation: Statistics
Prerequisite: BME 120
Contact time: 1 ppw 4 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 24
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.

EKN 110 Economics 110
Academic organisation: Economics
Contact time: 1 dpw 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
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 maximization, 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 on money, banking, interest rates and monetary policy concludes the module.

EKN 113 Economics 113
Academic organisation: Economics
Prerequisite: At least 6 (70-79%) in Mathematics in the Grade 12 examination or STK 113 (60%) and STK 123 (60%)
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 15
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.

EKN 120 Economics 120
Academic organisation: Economics
Prerequisite: EKN 110 GS or EKN 113 GS; 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: 2 lpw 1 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
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 module, 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, focussing on international trade, exchange rates, and the balance of payments. The economics of developing countries and South Africa in the global economy conclude the module.

EKN 123 Economics 123
Academic organisation: Economics
Prerequisite: EKN 113 GS and at least 6 (70-79%) in Mathematics in the Grade 12 examination of STK 113 (60%) and STK 123 (60%)
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 15
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.

EKN 214 Economics 214
Academic organisation: Economics
Prerequisite: EKN 110 GS and EKN 120 or EKN 113 GS and EKN 123 and STK 110 GS and STK 120 GS
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

EKN 224 Economics 224
Academic organisation: Economics
Prerequisite: EKN 110 GS and EKN 120 or EKN 113 GS and EKN 123 and STK 110 GS and STK 120 GS
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

EKN 234 Economics 234
Academic organisation: Economics
Prerequisite: EKN 214, STK 120
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
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.

EKN 244 Economics 244
Academic organisation: Economics
Prerequisite: EKN 224, STK 120
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 16
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 module includes topics of the mathematical and econometric analysis of microeconomic issues.

EKN 310 Economics 310
Academic organisation: Economics
Prerequisite: EKN 214, EKN 234
Contact time: 1 dpw 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 20

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.

EKN 314 Economics 314
Academic organisation: Economics
Prerequisite: EKN 234, EKN 244
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 20
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.

EKN 320 Economics 320
Academic organisation: Economics
Prerequisite: EKN 310 GS
Contact time: 1 dpw 2 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 20
Module content:
Economic analyses
Identification, collection and interpretation process of relevant economic data; the national accounts (ie 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.

EKN 325 Economics 325
Academic organisation: Economics
Prerequisite: EKN 214 and EKN 234
Contact time: 2 lpw 1 dpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 20
Module content:
Economic policy and development: Capita selecta
The module 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.

FBS 110 Financial management 110
Academic organisation: Financial Management
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 10
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.

FBS 112 Financial management 112
Academic organisation: Financial Management
Prerequisite: To be taken concurrently with WST 111
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 10
Module content:
*Only for BSc (Actuarial and Financial Mathematics and Mathematical Statistics) and BCom (Statistics) students
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.

FBS 120 Financial management 120
Academic organisation: Financial Management
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 10
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.

FBS 122 Financial management 122
Academic organisation: Financial Management
Prerequisite: To be taken concurrently with WST 121
Contact time: 3 lpw
Period of presentation: Semester 2

Language of tuition: English **Credits:** 10
Module content:
*Only for BSc (Actuarial and Financial Mathematics and Mathematical Statistics) and BCom (Statistics) students.
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.

FRK 111 Financial accounting 111
Academic organisation: Accounting
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
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.

FRK 121 Financial accounting 121
Academic organisation: Accounting
Prerequisite: FRK 111 GS
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
Property, plant and equipment; intangible assets; inventories; liabilities; presentation of financial statements; enterprises without profit motive; partnerships; companies; close corporations; cashflow statements; analysis and interpretation of financial statements.

FRK 122 Financial accounting 122
Academic organisation: Accounting
Prerequisite: FRK 111 GS or FRK 133, FRK 143
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
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.

INF 112 Informatics 112
Academic organisation: Informatics
Prerequisite: Refer to Regulation 1.2(e); or 60% for both STK 113, STK 123 or STK 110
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
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.

INF 154 Informatics 154
Academic organisation: Informatics
Prerequisite: Refer to Regulation 1.2(f)
Contact time: 1 lpw 2 ppw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
Introduction to programming.

INF 164 Informatics 164
Academic organisation: Informatics
Prerequisite: INF 154; Regulation1.2(f)
Contact time: 1 lpw 2 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
Advanced programming, use of a computer-aided software engineering tool.

INF 171 Informatics 171
Academic organisation: Informatics
Prerequisite: Regulation 1.2(f)
Contact time: 2 lpw
Period of presentation: Year
Language of tuition: Both Afr and Eng **Credits**: 20
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.

INF 214 Informatics 214
Academic organisation: Informatics
Prerequisite: AIM 101 or AIM 111 and AIM 121
Contact time: 2 ppw 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 14
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.

INF 225 Informatics 225
Academic organisation: Informatics
Prerequisite: INF 163 and INF 164; AIM 101 or AIM 111 and AIM 121
Contact time: 1 lpw 1 ppw 2 dpw

Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 14
Module content:
An overview of systems infrastructure and integration.

INF 261 Informatics 261
Academic organisation: Informatics
Prerequisite: INF 214
Contact time: 1 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 7
Module content:
Database management: transaction management, concurrent processes, recovery, database administration: new developments: distributed databases, client-server databases: practical implementation of databases.

INF 281 Informatics 281
Academic organisation: Informatics
Prerequisite: FRK 111, FRK 121 or FRK 100 or FRK 101
Contact time: 2 ppw
Period of presentation: Semester 1 or Semester 2
Language of tuition: English **Credits:** 3
Module content:
Computer processing of accounting information.

KOB 183 Communication management 183
Academic organisation: Division Communication Management Department Business Management
Contact time: 3 lpw
Period of presentation: Quarter 3
Language of tuition: Both Afr and Eng **Credits:** 5
Module content:
*Module content will be adapted in accordance with the appropriate degree programme. Only one of KOB 181–184 may be taken as a module where necessary for a programme.
Applied business communication skills
Acquiring basic business communication skills will enhance the capabilities of employees, managers and leaders in the business environment. An overview of applied skills on the intrapersonal, dyadic, interpersonal, group (team), organisational, public and mass communication contexts is provided.
The practical part of the module (for example, the writing of business reports and presentation skills) concentrates on the performance dimensions of these skills as applied to particular professions.

OBS 114 Business management 114
Academic organisation: Business Management
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 10
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.
Introduction to and overview of general management, especially regarding the five management tasks: strategic management; contemporary developments and management issues; financial management; marketing and public relations. 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).

OBS 124 Business management 124
Academic organisation: Business Management
Prerequisite: Admission to the examination in OBS 114 or OBS 133 and 143
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 10
Module content:
The nature and development of entrepreneurship; the individual entrepreneur and characteristics of South African entrepreneurs. Looking at the window of opportunity. Getting started (business start up). Exploring different routes to entrepreneurship: entering a family business, buying a franchise, home-based business and the business buyout.
This semester also covers how entrepreneurs can network and find support in their environments. Case studies of successful entrepreneurs – also South African entrepreneurs – are studied.

OBS 210 Business management 210
Academic organisation: Business Management
Prerequisite: OBS 114 or 124 with admission to the examination in the other
Contact time: 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
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.

OBS 220 Business management 220
Academic organisation: Business Management
Prerequisite: OBS 114 or 124 with admission to the examination in the other
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Project management: 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.

OBS 321 Entrepreneurship 321
Academic organisation: Business Management
Prerequisite: Admission to the examination in OBS 311
Contact time: 3 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 20
Module content:
*General service module available as elective module for other degree programmes.
Performance motivation: development of positive motives; role models; determining of the level of achievement motivation; reinforcement of the need for performance motivation; strategies and action plans.
Creativity, innovation, need for achievement, entrepreneurial role models and the development of risk propensity.

STK 110 Statistics 110
Academic organisation: Statistics
Prerequisite: 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 ppw 3 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 13
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.

STK 113 Statistics 113
Academic organisation: Statistics
Contact time: 1 ppw (during the last 7 weeks) 3 lpw 1 tpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 11
Module content:
*On its own, STK 113 and 123 will not be recognised for degree purposes, but exemption will be granted from 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, 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.

STK 120 Statistics 120
Academic organisation: Statistics
Prerequisite: STK 110 GS or both STK 113 GS and STK 123 GS or WST 133 and WST 143
Contact time: 3 lpw 1 ppw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 13
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, 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.

STK 123 Statistics 123
Academic organisation: Statistics
Prerequisite: STK 113 GS
Contact time: 1 ppw (during the last 7 weeks) 3 lpw 1 tpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
*On its own, STK 113 and 123 will not be recognized for degree purposes, but exemption will be granted from 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.

STK 161 Statistics 161
Academic organisation: Statistics
Prerequisite: STK110 GS or both STK 113 GS and STK 123 GS
Contact time: 1 ppw 3 lpw
Period of presentation: Quarter 3
Language of tuition: Both Afr and Eng **Credits:** 6
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

STK 162 Statistics 162
Academic organisation: Statistics
Prerequisite: STK110 GS or both STK 113 GS and STK 123 GS
Contact time: 1 ppw 3 lpw
Period of presentation: Quarter 4
Language of tuition: Both Afr and Eng **Credits:** 7
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).

STK 210 Statistics 210
Academic organisation: Statistics
Prerequisite: STK 110, STK 120
Contact time: 1 ppw 3 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 20
Module content:
Probability theory. Univariate probability distributions, expected values and moments. Special probability distributions: binomial, hypergeometric, poison, exponential, gamma, beta and normal distribution. Probability distributions and moments in the bivariate case. The bivariate normal distribution. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

STK 220 Statistics 220
Academic organisation: Statistics
Prerequisite: STK 210 GS
Contact time: 1 ppw 3 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 20
Module content:
Probability distributions and moments in the multivariate case. Multinomial distribution. Probability distributions of functions of random variables. Sampling procedures. Sampling

distributions. Statistical inference concerning means, variances and proportions in the one-sample and two-sample cases. Identification, use, evaluation and interpretation of statistical computer packages and techniques in the simulation of sampling distributions and the execution of statistical inference.

STK 281 Statistics 281
Academic organisation: Statistics
Prerequisite: STK 110, STK 120
Contact time: 1 ppw 2 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 10
Module content:
Applied regression analysis: simple and multiple regression, nonlinear regression, correlation, the use of dummy variables, heteroscedasticity, serial correlation and lag structures. Applied time-series analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

STK 310 Statistics 310
Academic organisation: Statistics
Prerequisite: STK 210, STK 220
Contact time: 1 ppw 3 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 25
Module content:
Regression analysis: simple and multiple regression; nonlinear regression; correlation and the use of dummy variables. Multivariate distributions: normal, multinomial and poison distribution. Linear combinations of normal variables. Analysis of variance and covariance. Categorical data analysis. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques.

STK 320 Statistics 320
Academic organisation: Statistics
Prerequisite: STK 310 GS
Contact time: 1 ppw 3 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 25
Module content:
Regression analysis extensions: heteroscedasticity, serial correlation and lag structures. Time-series analysis. Applications of matrices, differentiation and integration in the economic and management sciences. Evaluation of simple economic models. Theory and applications of time-series models: univariate time series. Stationary and non-stationary time series. ARMA and ARIMA models. Regression models. Model identification and estimation. Spectrum and periodogram. Forecasting with time-series models. Identification, use, evaluation and interpretation of statistical computer packages and statistical techniques. Student seminars.

TBE 210 Tourism management 210
Academic organisation: Tourism Management
Prerequisite: BEM 122 only for BConsumer Science (Hospitality Management)
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 16

Module content:
The Tourism System
This module introduces tourism management from a systems perspective covering tourism demand and supply as well as the impact of the environment. Tourism demand is viewed from tourist motivation to global movement and tourism supply from natural and cultural resources to industry sectors such as hospitality, transport and attractions (including events). The functional and physical links between demand and supply are introduced and the role and impact of legislation, policies, national, regional and local bodies and environmental trends analysed.

TBE 220 Tourism management 220
Academic organisation: Tourism Management
Prerequisite: TBE 210 GS
Contact time: 4 lpw
Period of presentation: Semester 2
Language of tuition: Double medium **Credits:** 16
Module content:
Strategic tourism management
This module presents two interlinking themes: Strategic destination marketing and contemporary tourism issues. Strategic destination marketing explores the unique characteristics of and approaches to marketing a tourist destination. It provides a management and operational framework for destination marketing and within this framework trends, practices and case studies in destination marketing are addressed. Contemporary tourism issues examine developments in tourism such sustainable and ecotourism tourism, cultural tourism and sport tourism.

TBE 310 Tourism management 310
Academic organisation: Tourism Management
Prerequisite: TBE 210 GS
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: Double medium **Credits:** 20
Module content:
Tourism industry sector management I
This module covers the management of two industry sectors: tourism attractions (including events) and hospitality. Visitor attractions (including events), which are at the core of successful tourism is addressed at three levels: the key role of visitor attractions/events in the tourism industry; the overall development process (feasibility studies, financial and design aspects, etc.) relating to visitor attractions/events; and finally the strategic management and operational aspects of visitor attractions/events.
Hospitality management covers all the operational and management functions of the “guest cycle” from the moment a potential guest contacts an accommodation establishment to the time that he or she departs. A distinction is drawn between revenue centres and support centres. Food and beverage management forms an essential ingredient of this section. As financial management and costing are critical to the success of any hospitality organisation, the policies, principles and procedures pertaining to financial operations and financial management in such establishments are also covered..

Alphabetical list of modules offered by the Faculty of Law

BER 210 Business law 210
Academic organisation: Mercantile Law
Contact time: 1 dpw 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Basic principles of law of contract. Law of sales, credit agreements, lease.

BER 220 Business law 220
Academic organisation: Mercantile Law
Prerequisite: Examination entrance for BER 210
Contact time: 1 dpw 2 lpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 16
Module content:
Labour law. Aspects of security law. Law of insolvency. Entrepreneurial law; company law, law concerning close corporations. Law of partnerships.

Alphabetical list of modules offered by the Faculty of Humanities

FIL 155 Science and world views 155
Academic organisation: Philosophy
Contact time: 1 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 6
Module content:
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 mechanisation. 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.

LST 110 Language and study skills 110
Academic organisation: Unit for Academic Literacy
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 6
Module content:
The module will aim to equip students with the ability to cope with the reading and writing demands of mainstream modules. LST 110 comprises two components: A flexible learning component that requires individual engagement with the online computer program. MyFoundationsLab; and a formal taught component utilising the scheduled contact periods.

MGW 112 People and their environment 112
Academic organisation: Sociology
Prerequisite: APS of 34 and 70% obtained in Mathematics in the Grade 12 examination and only for students admitted to relevant programmes
Contact time: 4 lpw
Period of presentation: Semester 1
Language of tuition: English **Credits:** 6
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.

MTL 180 Medical terminology 180
Academic organisation: Ancient Languages
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
Module content:
The module entails the acquisition of a basic medical orientated vocabulary compiled from Latin and Greek stem forms combined with prefixes and suffixes derived from these languages. The manner in which the meanings of medical terms can be determined by analyzing the terms into their recognizable meaningful constituent parts is taught and exercised. The functional application of medical terms in context as practical outcome of terminological application is continually attended to.

RES 210 Social research: Introductory methodology 210
Academic organisation: Psychology
Contact time: 2 lpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 20
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.

RES 320 Social research: Methodological thinking 320
Academic organisation: Sociology
Contact time: 2 lpw
Period of presentation: Semester 2
Language of tuition: English **Credits:** 30
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.

SLK 110 Psychology 110
Academic organisation: Psychology
Contact time: 2 lpw 2 dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 12
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.

SLK 120 Psychology 120
Academic organisation: Psychology
Contact time: 2 lpw 2 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 12
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.

SLK 210 Psychology 210
Academic organisation: Psychology
Prerequisite: SLK 110, 120(GS), (RES 210 recommended)
Contact time: 2 lpw 2 dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 20
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.

SLK 220 Psychology 220
Academic organisation: Psychology
Prerequisite: SLK 110, 120(GS), (RES 210 recommended)
Contact time: 2 lpw, 2 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 20
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.

SLK 310 Psychology 310
Academic organisation: Psychology
Prerequisite: SLK 210(GS), 220(GS), (RES 320 recommended)
Contact time: 2 lpw, 2 dpw
Period of presentation: Semester 1
Language of tuition: Both Afr and Eng **Credits:** 30
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.

SLK 320 Psychology 320
Academic organisation: Psychology
Prerequisite: SLK 310(GS), (RES 320 recommended)
Contact time: 2 lpw 2 dpw
Period of presentation: Semester 2
Language of tuition: Both Afr and Eng **Credits:** 30
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.

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