BSc Microbiology (02133404)

Minimum duration of study 3 years
Total credits 428

Admission requirements

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

Minimum requirements

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>English Home Language or English First Additional Language</th>
<th>Mathematics</th>
<th>Physical Science</th>
<th>APS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSC/IEB AS Level</td>
<td>NSC/IEB AS Level</td>
<td>AS Level NSC/IEB AS Level</td>
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<td>AS C Level C Level</td>
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</table>

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

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

BSc Extended Programme for the Biological and Agricultural Sciences

Minimum requirements

<table>
<thead>
<tr>
<th>Achievement level</th>
<th>English Home Language or English First Additional Language</th>
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<th>Physical Science</th>
<th>APS</th>
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<tr>
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<td>4 D 4 D 4 D</td>
<td>AS D Level D Level</td>
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</tbody>
</table>
Other programme-specific information

A student must pass all the minimum prescribed and elective module credits as set out at the end of each year within a programme as well as the total required credits to comply with the particular degree programme. Please refer to the curricula of the respective programmes. At least 144 credits must be obtained at 300-/400-level, or otherwise as indicated by curriculum. The minimum module credits needed to comply with degree requirements is set out at the end of each study programme. Subject to the programmes as indicated a maximum of 150 credits will be recognised at 100-level. A student may, in consultation with the 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 the respective curricula, a student may not register for more than 75 module credits per semester at first-year level subject to permission by the Dean. A student may be permitted to register for up to 80 module credits in the first semester during the first year provided that he or she obtained a final mark of no less than 70% for grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

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

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

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

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

The prerequisites are listed in the Alphabetical list of modules.

Promotion to next study year

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

General promotion requirements in the faculty

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

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

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

**Pass with distinction**

A student obtains his or her degree with distinction if all prescribed modules at 300-level (or higher) are passed in one academic year with a weighted average of at least 75%, and obtain at least a subminimum of 65% in each of the relevant modules.
Curriculum: Year 1

Minimum credits: 140

Minimum credits: 140
Fundamental = 12
Core = 128

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

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

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

Fundamental modules

Academic information management 102 (AIM 102)

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.

Module credits 6.00

Service modules
- Faculty of Education
- Faculty of Economic and Management Sciences
- Faculty of Humanities
- Faculty of Law
- Faculty of Health Sciences
- Faculty of Natural and Agricultural Sciences
- Faculty of Theology and Religion
- Faculty of Veterinary Science

Prerequisites No prerequisites.

Contact time 2 lectures per week

Language of tuition Module is presented in English

Department Information Science

Period of presentation Semester 2

Academic information management 111 (AIM 111)

Module content:
Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.
Module credits: 4.00

**Service modules**
- Faculty of Engineering, Built Environment and Information Technology
- Faculty of Education
- Faculty of Economic and Management Sciences
- Faculty of Humanities
- Faculty of Law
- Faculty of Health Sciences
- Faculty of Natural and Agricultural Sciences
- Faculty of Theology and Religion

**Prerequisites**
No prerequisites.

**Contact time**
2 lectures per week

**Language of tuition**
Module is presented in English

**Department**
Information Science

**Period of presentation**
Semester 1

### Academic information management 121 (AIM 121)

**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.

**Module credits**
4.00

**Service modules**
- Faculty of Engineering, Built Environment and Information Technology
- Faculty of Education
- Faculty of Economic and Management Sciences
- Faculty of Humanities
- Faculty of Law
- Faculty of Health Sciences
- Faculty of Natural and Agricultural Sciences
- Faculty of Theology and Religion
- Faculty of Veterinary Science

**Prerequisites**
No prerequisites.

**Contact time**
2 lectures per week

**Language of tuition**
Module is presented in English

**Department**
Informatics

**Period of presentation**
Semester 2

### Language and study skills 110 (LST 110)

**Module content:**
The module aims to equip students with the ability to cope with the reading and writing demands of scientific disciplines.
Module credits 6.00

Service modules
Faculty of Natural and Agricultural Sciences
Faculty of Veterinary Science

Prerequisites No prerequisites.

Contact time 2 lectures per week

Language of tuition Module is presented in English

Department Unit for Academic Literacy

Period of presentation Semester 1

**Academic orientation 102 (UPO 102)**

Module credits 0.00

Language of tuition Module is presented in English

Department Natural and Agricultural Sciences Deans Office

Period of presentation Year

**Core modules**

**Biometry 120 (BME 120)**

Module content:

Module credits 16.00

Service modules
Faculty of Engineering, Built Environment and Information Technology
Faculty of Natural and Agricultural Sciences
Faculty of Veterinary Science

Prerequisites At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123

Contact time 4 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Statistics

Period of presentation Semester 2
Plant biology 161 (BOT 161)

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.

Module credits 8.00

Service modules
Faculty of Engineering, Built Environment and Information Technology
Faculty of Education

Prerequisites
MLB 111 GS

Contact time 2 lectures per week, fortnightly practicals

Language of tuition Module is presented in English

Department Department of Plant and Soil Sciences

Period of presentation Semester 2

General chemistry 117 (CMY 117)

Module content:

Module credits 16.00

Service modules
Faculty of Engineering, Built Environment and Information Technology
Faculty of Education
Faculty of Health Sciences
Faculty of Veterinary Science

Prerequisites
A candidate must have Mathematics for at least 60% and 60% for Physical Sciences.

Contact time 4 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Chemistry

Period of presentation Semester 1

General chemistry 127 (CMY 127)

Module content:
Theory: General physical-analytical chemistry: Chemical equilibrium, acids and bases, buffers, solubility
equilibrium, entropy and free energy, electrochemistry. Organic chemistry: Structure (bonding), nomenclature, isomerism, introductory stereochemistry, introduction to chemical reactions and chemical properties of organic compounds and biological compounds, i.e. carbohydrates and aminoacids. Practical: Molecular structure (model building), synthesis and properties of simple organic compounds.

<table>
<thead>
<tr>
<th>Module credits</th>
<th>16.00</th>
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</thead>
</table>
| Service modules | Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Health Sciences  
Faculty of Veterinary Science |
| Prerequisites | Natural and Agricultural Sciences students: CMY 117 GS or CMY 154 GS  
Health Sciences students: none |
| Contact time | 4 lectures per week, 1 practical per week |
| Language of tuition | Module is presented in English |
| Department | Chemistry |
| Period of presentation | Semester 2 |

### Introductory genetics 161 (GTS 161)

**Module content:**

<table>
<thead>
<tr>
<th>Module credits</th>
<th>8.00</th>
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</thead>
</table>
| Service modules | Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Veterinary Science |
| Prerequisites | MLB 111 GS |
| Contact time | 2 lectures per week, fortnightly practicals |
| Language of tuition | Module is presented in English |
| Department | Biochemistry, Genetics and Microbiology |
| Period of presentation | Semester 2 |

### Introduction to microbiology 161 (MBY 161)

**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.

**Module credits** 8.00  
**Service modules** Faculty of Engineering, Built Environment and Information Technology  
**Prerequisites** MLB 111 GS  
**Contact time** 2 lectures per week, 1 practical per week  
**Language of tuition** Module is presented in English  
**Department** Biochemistry, Genetics and Microbiology  
**Period of presentation** Semester 2

### Molecular and cell biology 111 (MLB 111)

**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.

**Module credits** 16.00  
**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Health Sciences  
Faculty of Veterinary Science  
**Prerequisites** A candidate who has passed Mathematics with at least 60% in the Grade 12 examination  
**Contact time** 4 lectures per week, 1 practical per week  
**Language of tuition** Module is presented in English  
**Department** Biochemistry, Genetics and Microbiology  
**Period of presentation** Semester 1

### Physics for biology students 131 (PHY 131)

**Module content:**
Units, vectors, one dimensional kinematics, dynamics, work, equilibrium, sound, liquids, heat, thermodynamic processes, electric potential and capacitance, direct current and alternating current, optics, modern physics, radio activity.

**Module credits** 16.00  
**Service modules** Faculty of Education  
Faculty of Health Sciences  
Faculty of Veterinary Science  
**Prerequisites** A candidate must have passed Mathematics with at least 60% in the Grade 12 examination
Contact time | 4 lectures per week, 1 practical per week, 1 discussion class per week
---|---
Language of tuition | Module is presented in English
Department | Physics
Period of presentation | Semester 1

**Mathematics 134 (WTW 134)**

**Module content:**
*Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 165, WTW 114, WTW 158. WTW 134 does not lead to admission to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 134 is offered as WTW 165 in the second semester only to students who have applied in the first semester of the current year for the approximately 65 MBChB, or the 5-6 BChD places becoming available in the second semester and who were therefore enrolled for MGW 112 in the first semester of the current year.*

Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration. Matrices, solutions of systems of equations. All topics are studied in the context of applications.

**Module credits** | 16.00
---|---
**Service modules** | Faculty of Engineering, Built Environment and Information Technology
| Faculty of Education
| Faculty of Veterinary Science
**Prerequisites** | 50% for Mathematics in Grade 12
**Contact time** | 1 tutorial per week, 4 lectures per week
**Language of tuition** | Module is presented in English
Department | Mathematics and Applied Mathematics
Period of presentation | Semester 1

**Mathematics 165 (WTW 165)**

**Module content:**
*Students will not be credited for more than one of the following modules for their degree: WTW 134, WTW 165, WTW 114, WTW 158. WTW 165 does not lead to Mathematics at 200 level and is intended for students who require Mathematics at 100 level only. WTW 165 is offered in English in the second semester only to students who have applied in the first semester of the current year for the approximately 65 MBChB, or the 5-6 BChD places becoming available in the second semester and who were therefore enrolled for MGW 112 in the first semester of the current year.*

Functions, derivatives, interpretation of the derivative, rules of differentiation, applications of differentiation, integration, interpretation of the definite integral, applications of integration, matrices, solutions of systems of equations. All topics are studied in the context of applications.

**Module credits** | 16.00
Service modules
Faculty of Education, Built Environment and Information Technology
Faculty of Education
Faculty of Economic and Management Sciences
Faculty of Veterinary Science

Prerequisites
50% for Mathematics in Grade 12 and MGW 112# or registered for BVSc

Contact time
1 tutorial per week, 4 lectures per week

Language of tuition
Module is presented in English

Department
Mathematics and Applied Mathematics

Period of presentation
Semester 2

Animal diversity 161 (ZEN 161)

Module content:
Animal classification, phylogeny, organization and terminology. Evolution of the various animal phyla, morphological characteristics and life cycles of parasitic and non-parasitic animals. Structure and function of reproductive, respiratory, excretory, circulatory and digestive systems.

Module credits
8.00

Service modules
Faculty of Education
Faculty of Veterinary Science

Prerequisites
MLB 111 GS or TDH

Contact time
2 lectures per week, fortnightly practicals

Language of tuition
Module is presented in English

Department
Zoology and Entomology

Period of presentation
Semester 2
Curriculum: Year 2

Minimum credits: 144

Minimum credits:
Core = 144

Additional information:

Single major track:

- **Applied Microbiology option**: ZEN 251 may be replaced with FST 250. Students may replace ZEN 261 and/or BOT 261 with either PLG 262 or FST 260 or BCM 262.
- **Medical Microbiology option**: Students must replace ZEN 251 and BOT 251 with FLG 211 and FLG 212. Students must replace ZEN 261 and BOT 261 with FLG 221 and FLG 222.

Dual major track:

- **Microbiology and Biochemistry combination**: Students must replace ZEN 251 and BOT 251 with CMY 282 and CMY 284. Students must replace ZEN 261 and BOT 261 with CMY 283 and BCM 262.
- **Microbiology and Genetics combination**: Students may replace ZEN 261 with PLG 262.
- **Microbiology and Plant Science option**: Students may replace ZEN 261 with PLG 262.

Core modules

**Introduction to proteins and enzymes 251 (BCM 251)**

Module content:
Structural and ionic properties of amino acids. Peptides, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Interactions that stabilise protein structure, denaturation and renaturation of proteins. Introduction to methods for the purification of proteins, amino acid composition, and sequence determinations. 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.

**Module credits**
12.00

**Service modules**
Faculty of Health Sciences

**Prerequisites**
CMY 117 GS and CMY 127 GS and MLB 111 GS

**Contact time**
2 lectures per week, 90 minute practical per week

**Language of tuition**
Module is presented in English

**Department**
Biochemistry, Genetics and Microbiology

**Period of presentation**
Semester 1

**Carbohydrate metabolism 252 (BCM 252)**

Module content:
training in study and analysis of metabolic pathways and enzymes. Scientific method and design: Hypothesis design and testing, method design and scientific controls.

<table>
<thead>
<tr>
<th>Module credits</th>
<th>12.00</th>
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</thead>
</table>
| Service modules | Faculty of Education  
Faculty of Health Sciences |
| Prerequisites | CMY 117 GS and CMY 127 GS and MLB 111 GS |
| Contact time | 2 lectures per week, 90 minute practical per week |
| Language of tuition | Module is presented in English |
| Department | Biochemistry, Genetics and Microbiology |
| Period of presentation | Semester 1 |

**Lipid and nitrogen metabolism 261 (BCM 261)**

**Module content:**

<table>
<thead>
<tr>
<th>Module credits</th>
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<tr>
<td>Period of presentation</td>
<td>Semester 2</td>
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</tbody>
</table>

**South African flora and vegetation 251 (BOT 251)**

**Module content:**
Origin and affinity of South African flora and vegetation types; principles of plant geography; plant diversity in southern Africa; characteristics, environments and vegetation of South African biomes and associated key ecological processes; centra of plant endemism; rare and threatened plant species; biodiversity conservation and ecosystem management; invasion biology; conservation status of South African vegetation types.

<table>
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<td>Prerequisites</td>
<td>BOT 161 or permission from head of department</td>
</tr>
<tr>
<td><strong>Contact time</strong></td>
<td>2 lectures per week, 1 practical per week</td>
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</tr>
<tr>
<td><strong>Language of tuition</strong></td>
<td>Separate classes for Afrikaans and English</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>Department of Plant and Soil Sciences</td>
</tr>
<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

**Plant physiology and biotechnology 261 (BOT 261)**

**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.

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<td><strong>Contact time</strong></td>
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<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 2</td>
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</table>

**Molecular genetics 251 (GTS 251)**

**Module content:**

<table>
<thead>
<tr>
<th><strong>Module credits</strong></th>
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<tbody>
<tr>
<td><strong>Service modules</strong></td>
<td>Faculty of Engineering, Built Environment and Information Technology Faculty of Education</td>
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<tr>
<td><strong>Prerequisites</strong></td>
<td>GTS 161 GS</td>
</tr>
<tr>
<td><strong>Contact time</strong></td>
<td>2 lectures per week, fortnightly practicals</td>
</tr>
<tr>
<td><strong>Language of tuition</strong></td>
<td>Module is presented in English</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>Biochemistry, Genetics and Microbiology</td>
</tr>
<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 1</td>
</tr>
</tbody>
</table>

**Genetic diversity and evolution 261 (GTS 261)**

**Module content:**

**Module credits** 12.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology
Faculty of Education

**Prerequisites** GTS 251 GS

**Contact time** 2 lectures per week, fortnightly practicals

**Language of tuition** Module is presented in English

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

**Bacteriology 251 (MBY 251)**

**Module content:**

**Module credits** 12.00

**Service modules** Faculty of Engineering, Built Environment and Information Technology

**Prerequisites** MBY 161 GS

**Contact time** 2 lectures per week, 1 practical per week

**Language of tuition** Module is presented in English

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

**Mycology 261 (MBY 261)**

**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.

**Module credits** 12.00
### Service modules

**Faculty of Engineering, Built Environment and Information Technology**

<table>
<thead>
<tr>
<th>Prerequisites</th>
<th>MBY 161 GS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact time</td>
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<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
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<tr>
<td>Department</td>
<td>Biochemistry, Genetics and Microbiology</td>
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<tr>
<td>Period of presentation</td>
<td>Semester 2</td>
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</tbody>
</table>

### Food microbiology 262 (MBY 262)

**Module content:**
Primary sources of microorganisms in food. Factors affecting the growth and survival of microorganisms in food. Microbial quality, spoilage and safety of food. Different organisms involved, their isolation, screening and detection. Conventional approaches, alternative methods rapid methods. Food fermentations: fermentation types, principles and organisms involved.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>MBY 251 or TDH</td>
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<tr>
<td>Contact time</td>
<td>2 lectures per week, 1 practical per week</td>
</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Biochemistry, Genetics and Microbiology</td>
</tr>
<tr>
<td>Period of presentation</td>
<td>Semester 2</td>
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</tbody>
</table>

### Invertebrate biology 251 (ZEN 251)

**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.

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<td>Service modules</td>
<td>Faculty of Education</td>
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<tr>
<td>Prerequisites</td>
<td>ZEN 161 GS or TDH</td>
</tr>
<tr>
<td>Contact time</td>
<td>4 lectures per week, 1 practical per week</td>
</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Zoology and Entomology</td>
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<tr>
<td>Period of presentation</td>
<td>Quarter 1</td>
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</tbody>
</table>
**African vertebrates 261 (ZEN 261)**

**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.

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<tr>
<td>Service modules</td>
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<tr>
<td>Prerequisites</td>
<td>ZEN 161 GS or TDH</td>
</tr>
<tr>
<td>Contact time</td>
<td>4 lectures per week, 1 practical per week</td>
</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Zoology and Entomology</td>
</tr>
<tr>
<td>Period of presentation</td>
<td>Quarter 3</td>
</tr>
</tbody>
</table>

**Elective modules**

**Physical chemistry 282 (CMY 282)**

**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.

<table>
<thead>
<tr>
<th>Module credits</th>
<th>12.00</th>
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<tbody>
<tr>
<td>Service modules</td>
<td>Faculty of Education</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>CMY 117 and CMY 127</td>
</tr>
<tr>
<td>Contact time</td>
<td>1 tutorial per week, 4 lectures per week, 2 practicals per week</td>
</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Period of presentation</td>
<td>Quarter 2</td>
</tr>
</tbody>
</table>

**Analytical chemistry 283 (CMY 283)**

**Module content:**
Theory: Statistical evaluation of data, gravimetric analysis, aqueous solution chemistry, chemical equilibrium, precipitation-, neutralisation- and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry.

<table>
<thead>
<tr>
<th>Module credits</th>
<th>12.00</th>
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<tbody>
<tr>
<td>Service modules</td>
<td>Faculty of Education</td>
</tr>
</tbody>
</table>
Organic chemistry 284 (CMY 284)

Module content:

Module credits 12.00

Introductory and neurophysiology 211 (FLG 211)

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.

Module credits 12.00

Circulatory physiology 212 (FLG 212)

Module content:
Body fluids; haematology; cardiovascular physiology and the lymphatic system. Practical work: Practical exercises to complement the theory.

**Module credits** | 12.00
---|---
**Service modules** | Faculty of Natural and Agricultural Sciences
**Prerequisites** | CMY 117, CMY 127, MLB 111 and PHY 131
**Contact time** | 2 lectures per week, 1 practical per week
**Language of tuition** | Module is presented in English
**Department** | Physiology
**Period of presentation** | Semester 1

### Lung and renal physiology, acid-base balance and temperature 221 (FLG 221)

**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.

**Module credits** | 12.00
---|---
**Service modules** | Faculty of Natural and Agricultural Sciences
**Prerequisites** | FLG 211 and FLG 212
**Contact time** | 2 lectures per week, 1 practical per week
**Language of tuition** | Module is presented in English
**Department** | Physiology
**Period of presentation** | Semester 2

### Digestion, endocrinology and reproductive systems 222 (FLG 222)

**Module content:**
Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems.

Practical work: Practical exercises to complement the theory.

**Module credits** | 12.00
---|---
**Service modules** | Faculty of Natural and Agricultural Sciences
**Prerequisites** | FLG 211 and FLG 212
**Contact time** | 2 lectures per week, 1 practical per week
**Language of tuition** | Module is presented in English
**Department** | Physiology
**Period of presentation** | Semester 2
Introduction to food science and technology 250 (FST 250)

Module content:

Module credits 12.00
Prerequisites CMY 117 and CMY 127 and PHY 131 and WTW 134 or WTW 165 or TDH
Contact time 2 lectures per week, 1 practical per week
Language of tuition Module is presented in English
Department Consumer and Food Sciences
Period of presentation Semester 1

Principles of food processing and preservation 260 (FST 260)

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.

Module credits 12.00
Prerequisites CMY 117, CMY 127, MBY 161, PHY 131 and WTW 134 or WTW 165 or TDH
Contact time 2 lectures per week, 1 practical per week
Language of tuition Module is presented in English
Department Consumer and Food Sciences
Period of presentation Semester 1 and Semester 2

Principles of plant pathology 262 (PLG 262)

Module content:

Module credits 12.00
Prerequisites MBY 161


<table>
<thead>
<tr>
<th><strong>Contact time</strong></th>
<th>2 lectures per week, 1 practical per week</th>
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<tr>
<td><strong>Language of tuition</strong></td>
<td>Afrikaans and English are used in one class</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>Department of Plant and Soil Sciences</td>
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<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 2</td>
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</tbody>
</table>
Curriculum: Final year

Minimum credits: 144

Minimum credits: 144
Core = 72
Elective = 72

Additional information:

Single major track:

- **Applied Microbiology option**: Students may select electives from BCM 356, BCM 357, BOT 356, BOT 358, GTS 351, GTS 354, PLG 351, ZEN 355, BCM 367, BCM 368, BOT 365, BTC 361, FST 362, GTS 367 or ZEN 365.

- **Medical Microbiology option**: Students may select electives from BCM 356, BCM 357, BCM 367, BCM 368, GTS 351, GTS 354, GTS 367 or GTS 368.

- Students can only take a module if they comply with all the prerequisites.

Dual major track:

- **Microbiology and Biochemistry combination**: Students must take BCM 356, BCM 357, BCM 367 and BCM 368.

- **Microbiology and Genetics combination**: Students must take GTS 351, GTS 354, GTS 367 and either GTS 368 or BTC 361.

- **Microbiology and Plant Science option**: Students must take BOT 356, BOT 358, BOT 365 and BTC 361.

Core modules

**Virology 351 (MBY 351)**

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.

<table>
<thead>
<tr>
<th>Module credits</th>
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<tbody>
<tr>
<td>Prerequisites</td>
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<td>Contact time</td>
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<td>Language of tuition</td>
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<tr>
<td>Department</td>
<td>Biochemistry, Genetics and Microbiology</td>
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<tr>
<td>Period of presentation</td>
<td>Semester 1</td>
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</tbody>
</table>

**Bacterial genetics 355 (MBY 355)**

Module content:

| Module credits | 18.00 |
| **Prerequisites** | GTS 251 GS, GTS 261 GS, MBY 161, MBY 251 GS and MBY 262 GS or TDH |
| **Contact time** | 2 lectures per week, 1 practical per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Biochemistry, Genetics and Microbiology |
| **Period of presentation** | Semester 1 |

**Genetic manipulation of microbes 364 (MBY 364)**

**Module content:**
Isolation of clonable DNA (genomic libraries, cDNA synthesis) cloning vectors (plasmids, bacteriophages, cosmids) plasmid incompatibility and control of copy number. Ligation of DNA fragments, modification of DNA end and different ligation strategies. Direct and indirect methods for the identification of recombinant organisms. Characterization (polymerase chain reaction, nucleic acid sequencing) and mutagenesis of cloned DNA fragments. Gene expression in Gram negative (E.coli) Gram positive (B.subtilis) and yeast cells (S.cerevisae). Use of Agrobacterium and baculoviruses for gene expression in plant and insect cells respectively. Applications in protein engineering, diagnostics and synthesis of useful products.

| **Module credits** | 18.00 |
| **Prerequisites** | BCM 251, GTS 251 and MBY 251 or TDH |
| **Contact time** | 2 lectures per week, 1 practical per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Biochemistry, Genetics and Microbiology |
| **Period of presentation** | Semester 2 |

**Microbe interactions 365 (MBY 365)**

**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.

| **Module credits** | 18.00 |
| **Prerequisites** | GTS 251, MBY 251, MBY 261 GS, MBY 262 GS, and MBY 355 GS or TDH |
| **Contact time** | 2 lectures per week, 1 practical per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Biochemistry, Genetics and Microbiology |
| **Period of presentation** | Semester 2 |
Elective modules

**Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356)**

**Module content:**


**Module credits**

18.00

**Prerequisites**

BCM 251 or TDH

**Contact time**

2 lectures per week, 180 minute practical per week

**Language of tuition**

Module is presented in English

**Department**

Biochemistry, Genetics and Microbiology

**Period of presentation**

Semester 1

**Biocatalysis and integration of metabolism 357 (BCM 357)**

**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.

**Module credits** 18.00

**Prerequisites** BCM 251 and BCM 252 and BCM 261 or TDH

**Contact time** 2 lectures per week, 180 minute practical per week

**Language of tuition** Module is presented in English

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

**Cell structure and function 367 (BCM 367)**

**Module content:**

**Module credits** 18.00

**Prerequisites** BCM 251 and BCM 261 or TDH

**Contact time** 2 lectures per week, 180 minute practical per week

**Language of tuition** Module is presented in English

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

**Molecular basis of disease 368 (BCM 368)**

**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, specificity and accuracy, applications of polyclonal and monoclonal antibodies for characterisation of disease with fluorescence, confocal and electron microscopy, flow cytometry and biosensors.

**Module credits** 18.00
**Plant ecophysiology 356 (BOT 356)**

**Module content:**
The emphasis is on the efficiency of the mechanisms whereby C3-, C4 and CAM-plants bind CO2 and how it impacted upon by environmental factors. The mechanisms and factors which determine the respiratory conversion of carbon skeletons and how production is affected thereby will be discussed. Insight into the ecological distribution and manipulation of plants for increased production is gained by discussing the internal mechanisms whereby carbon allocation, hormone production, growth, flowering and fruitset are influenced by external factors. To understand the functioning of plants in diverse environments, the relevant structural properties of plants, and the impact of soil composition, water flow in the soil-plant air continuum and long distance transport of assimilates will be discussed. Various important techniques will be used in the practicals to investigate aspects such as water-use efficiency, photosynthesis and respiration of plants.

**Module credits**
18.00

**Service modules**
Faculty of Education

**Prerequisites**
BOT 161 or permission from head of department

**Contact time**
2 lectures per week, 1 practical per week

**Language of tuition**
Separate classes for Afrikaans and English

**Department**
Department of Plant and Soil Sciences

**Period of presentation**
Semester 1

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**Plant ecology 358 (BOT 358)**

**Module content:**
Theory of plant community concepts, floristic and structural composition, plant diversity, ecological succession, landscape ecology. Data processing techniques. Species interactions and an evaluation of their effects on interacting species. Fundamentals of plant population biology: life tables; plant breeding systems and pollination; population dynamics; life history strategies; intraspecific competition; interspecific competition and co-existence.

**Module credits**
18.00

**Prerequisites**
BOT 161 and BOT 251 or permission from head of department

**Contact time**
2 lectures per week, 1 practical per week

**Language of tuition**
Separate classes for Afrikaans and English

**Department**
Department of Plant and Soil Sciences
Period of presentation  Semester 1

### Phytomedicine 365 (BOT 365)

**Module content:**
The module will include a review on the discovery and use of plant medicines and phyto-therapeutically important molecules obtained from plants. Certain aspects of natural product chemistry i.e. the biosynthesis, ecological role and toxicity of the three main classes of secondary compounds; terpenoids, phenolics, and alkaloids are discussed. An introduction to the principles and applications of metabolomics is presented. The role of these natural products in defense against microorganisms and herbivores is reviewed during the module. The importance of ethnobotany and phylogenetics in modern drug discovery from biodiversity will presented along with legal and ethical considerations surrounding bioprospecting. This will follow on with modern theories and practices regarding sustainable utilisation and conservation of medicinal plants. The basics of alternative medicines, with an emphasis on traditional African and Chinese medicines, are also discussed as well as current evidence-based research and product development derived from these. Biotechnological approaches to medicinal natural product production, ‘farmer to pharma’, will be covered, including plant cell culture and bioreactors. Practical sessions on drug discovery approaches using chromatographic techniques for phytochemical analysis of secondary metabolites such as tannins, alkaloids, and saponins are conducted. Bioassays on micro-organisms are also done during the practical sessions in order to develop the skills for the potential discovery of new antibiotics.

**Module credits**  18.00

**Service modules**  Faculty of Education

**Prerequisites**  BOT 161 or permission from head of department

**Contact time**  2 lectures per week, 1 practical per week

**Language of tuition**  Module is presented in English

**Department**  Department of Plant and Soil Sciences

**Period of presentation**  Semester 2

### Plant genetics and crop biotechnology 361 (BTC 361)

**Module content:**

**Module credits**  18.00

**Service modules**  Faculty of Engineering, Built Environment and Information Technology

**Prerequisites**  GTS 251 and {GTS 261 GS or BOT 261}
<table>
<thead>
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<th><strong>Contact time</strong></th>
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<tbody>
<tr>
<td><strong>Language of tuition</strong></td>
<td>Module is presented in English</td>
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<tr>
<td><strong>Department</strong></td>
<td>Biochemistry, Genetics and Microbiology</td>
</tr>
<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 2</td>
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</table>

**Advanced animal and plant foods microbiology 362 (FST 362)**

**Module content:**
With an integrated focus on animal and plant food commodities, this module considers food properties and processing operations that impact on the growth, survival and biochemical activity of microorganisms as they relate to spoilage, safety and fermentation. Temperature effects on microbial growth and survival including thermal destruction and cell and spore injury. Microbial stress response (adaptation) during processing. Selection for stress resistant and more virulent pathogenic variants and virulence mechanisms (toxin structure/function) of food-borne pathogens during food processing. Theory and practice of new advances in microbial detection and identification methods. Tools for the production of safe foods including food safety objectives (FSOs) and risk analysis. Practicals will include advanced microbial detection and identification methods applied to animal and plant foods as well as the food supply chain.

<table>
<thead>
<tr>
<th><strong>Module credits</strong></th>
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<tbody>
<tr>
<td><strong>Prerequisites</strong></td>
<td>FST 260, MBY 251, MBY 261, MBY 262</td>
</tr>
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<td><strong>Contact time</strong></td>
<td>2 lectures per week, 180 minute practical per week</td>
</tr>
<tr>
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<td>Module is presented in English</td>
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<tr>
<td><strong>Department</strong></td>
<td>Consumer and Food Sciences</td>
</tr>
<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 1</td>
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</tbody>
</table>

**Eukaryotic gene control and development 351 (GTS 351)**

**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 controlin embryonic development and differentiation, cancer and other diseases in humans.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Prerequisites</strong></td>
<td>GTS 251 GS and GTS 261 GS</td>
</tr>
<tr>
<td><strong>Contact time</strong></td>
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</tr>
<tr>
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<td>Module is presented in English</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>Biochemistry, Genetics and Microbiology</td>
</tr>
<tr>
<td><strong>Period of presentation</strong></td>
<td>Semester 1</td>
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</tbody>
</table>
Genome evolution and phylogenetics 354 (GTS 354)

Module content:

Module credits 18.00
Service modules Faculty of Engineering, Built Environment and Information Technology
Prerequisites GTS 251 GS and GTS 261 GS
Contact time 2 lectures per week, 1 practical per week
Language of tuition Module is presented in English
Department Biochemistry, Genetics and Microbiology
Period of presentation Semester 1

Population and evolutionary genetics 367 (GTS 367)

Module content:

Module credits 18.00
Service modules Faculty of Engineering, Built Environment and Information Technology
Prerequisites GTS 251 and GTS 261 or TDH
Contact time 2 lectures per week, 1 practical per week
Language of tuition Module is presented in English
Department Biochemistry, Genetics and Microbiology
Period of presentation Semester 2

Genetics in human health 368 (GTS 368)

Module content:
### General plant pathology 351 (PLG 351)

**Module content:**
Principles and examples of plant diseases and their socio-economic importance. Current trends in plant pathology such as biosecurity, sanitary and phytosanitary issues of trade. Risk assessment 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.

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<tbody>
<tr>
<td>Prerequisites</td>
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<tr>
<td>Contact time</td>
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</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Biochemistry, Genetics and Microbiology</td>
</tr>
<tr>
<td>Period of presentation</td>
<td>Semester 2</td>
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</tbody>
</table>

### Insect diversity 355 (ZEN 355)

**Module content:**
The extent and significance of insect diversity. Functional insect morphology. The basic principles of taxonomy and the classification of taxa within the Insecta. Insect orders and economically and ecologically important Southern African insect families. Identification of insect orders and families using distinguishing characteristics. General biological and behavioural characteristics of each group. Grouping of insects into similar life-styles and habitats.

<table>
<thead>
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<tr>
<td>Service modules</td>
<td>Faculty of Education</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>ZEN 251 GS or TDH</td>
</tr>
<tr>
<td>Contact time</td>
<td>4 lectures per week, 2 practicals per week</td>
</tr>
<tr>
<td>Language of tuition</td>
<td>Module is presented in English</td>
</tr>
<tr>
<td>Department</td>
<td>Zoology and Entomology</td>
</tr>
<tr>
<td>Period of presentation</td>
<td>Quarter 1</td>
</tr>
</tbody>
</table>
**Applied entomology 365 (ZEN 365)**

**Module content:**
*It is strongly recommended that students first complete ZEN 355: Insect diversity 355 Impact of insects on economies, human health and well-being. Protection of corps from insect herbivores through monitoring, forecasting and application of the principles of integrated pest management; epidemiology and modern developments in the control of insect vectors of human and animal diseases; insects as a tool in forensic investigations; ecological and economic significance of insect pollinators and current threats to their survival and health. Lecturers will be complemented by practical experiences that provide students with skills in the design, conduct, analysis, interpretation and reporting of applied entomological research.*

<table>
<thead>
<tr>
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<th>18.00</th>
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<tbody>
<tr>
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<td>Faculty of Education</td>
</tr>
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<td>Prerequisites</td>
<td>No prerequisites.</td>
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<tr>
<td>Contact time</td>
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</tr>
<tr>
<td>Language of tuition</td>
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<tr>
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<td>Zoology and Entomology</td>
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<tr>
<td>Period of presentation</td>
<td>Quarter 4</td>
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</table>

The information published here is subject to change and may be amended after the publication of this information. The **General Regulations (G Regulations)** apply to all faculties of the University of Pretoria. It is expected of each student to familiarise himself or herself well with these regulations as well as with the information contained in the **General Rules** section. Ignorance concerning these regulations and rules will not be accepted as an excuse for any transgression.