

# University of Pretoria Yearbook 2023

## BSc (Microbiology) (02133404)

**Department** Genetics

**Minimum duration of study** 3 years

**Total credits** 430

**NQF level** 07

## Programme information

Those students registered for the BSc (Microbiology) programme and who have opted to select any of the dual major fields of study offered within this programme must take note of the following:

- Their Academic Record will list all the modules that they have completed towards a second major field of study (based on final year modules completed).
- Their Degree certificate will only print the officially approved programme name:

Bachelor of Science  
Microbiology

## Admission requirements

### Important information for all prospective students for 2023

The admission requirements below apply to all who apply for admission to the University of Pretoria with a **National Senior Certificate (NSC) and Independent Examination Board (IEB) qualifications**. [Click here](#) for this Faculty Brochure.

| Minimum requirements   |             |                   |     |
|--|-------------|-------------------|-----|
| Achievement level  |             |                   |     |
| English Home<br>Language or<br>English First<br>Additional<br>Language | Mathematics | Physical Sciences | APS |
| NSC/IEB  | NSC/IEB     | NSC/IEB           |     |
| 5  | 5           | 5                 | 32  |

Life Orientation is excluded when calculating the APS.

You will be considered for final admission to degree studies if space allows, and if you have a National Senior Certificate (NSC) or equivalent qualification with admission to bachelor's degree studies, and comply with the minimum subject requirements as well as the APS requirements of your chosen programme.

**Applicants with qualifications other than the abovementioned** should refer to the Brochure: Undergraduate Programme Information 2023: Qualifications other than the NSC and IEB, available at [click here](#).  
International students: [Click here](#).

## Transferring students

A transferring student is a student who, at the time of applying at the University of Pretoria (UP) is/was a registered student at another tertiary institution. A transferring student will be considered for admission based on NSC or equivalent qualification and previous academic performance. Students who have been dismissed from other institutions due to poor academic performance will not be considered for admission to UP.

**Closing dates:** Same as above.

## Returning students

A returning student is a student who, at the time of application for a degree programme is/was a registered student at UP, and wants to transfer to another degree at UP. A returning student will be considered for admission based on NSC or equivalent qualification and previous academic performance.

### Note:

- Students who have been excluded/dismissed from a faculty due to poor academic performance may be considered for admission to another programme at UP, as per faculty-specific requirements.
- Only ONE transfer between UP faculties and TWO transfers within a faculty will be allowed.
- Admission of returning students will always depend on the faculty concerned and the availability of space in the programmes for which they apply.

## Closing date for applications from returning students

Unless capacity allows for an extension of the closing date, applications from returning students must be submitted before the end of August via your UP Student Centre.

Candidates who do not comply with the minimum admission requirements for BSc (Microbiology), may be considered for admission to the BSc – Extended programme – Biological and Agricultural Sciences, which requires an additional year of study.

## BSc – Extended Programme – Biological and Agricultural Sciences

### Minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

NSC/IEB

4

#### Mathematics

NSC/IEB

4

#### Physical Sciences

NSC/IEB

4

#### APS

26

### Note:

\*The BSc – Extended programmes are not available for students who meet all the requirements for the corresponding mainstream programme.

\*Please note that only students who apply in their final NSC or equivalent qualification year will be considered for admission into any of the BSc – Extended programmes. Students who are upgrading or taking a gap year will not be considered.

## Other programme-specific information

### 1.1 Requirements for specific modules

A candidate who:

- a. does not qualify for STK 110, must enrol for STK 113 and STK 123;
- b. registers for Mathematical Statistics (WST) and Statistics (STK) modules must take note that WST and STK modules, except for STK 281, may not be taken simultaneously in a programme; a student must take one and only one of the following options:
  - WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, WST 321, and STK 353  
or
  - WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, STK 320, STK 353.  
or
  - STK 110, STK 122, STK 210, STK 220, WST 212, STK 310, STK 320, STK 353.
- c. registers for a module presented by another faculty must take note of the timetable clashes, prerequisites for that module, subminimum required in examination papers, supplementary examinations, etc.

### 1.2 Fundamental modules

- a. It is compulsory for all new first-year students to satisfactorily complete the Academic orientation (UPO 102) and to take Academic information management modules (AIM 111 and AIM 121) and Language and study skills (LST 110). Please see curricula for details.
- b. Students who intend to apply for admission to MBChB or BChD in the second semester, when places become available in those programmes, may be permitted to register for up to 80 module credits and 4 core modules in the first semester during the first year provided that they obtained a final mark of no less than 70% for Grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

## Promotion to next study year

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

### General promotion requirements in the faculty

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

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

Committee.

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

## General information

### **University of Pretoria Programme Qualification Mix (PQM) verification project**

*The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to contact their faculties if they have any questions.*



## Curriculum: Year 1

### Minimum credits: 140

Fundamental modules = 14

Core modules = 128

### Additional information:

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 111 (AIM 111)

**Module credits** 4.00

**NQF Level** 05

#### Service modules

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

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

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

**Department** Information Science

**Period of presentation** Semester 1

#### Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.

### Academic information management 121 (AIM 121)

**Module credits** 4.00

**NQF Level** 05

|                        |   |
|------------------------|---|
| <b>Service modules</b> | Faculty of Engineering, Built Environment and Information Technology<br>Faculty of Education<br>Faculty of Economic and Management Sciences<br>Faculty of Humanities<br>Faculty of Law<br>Faculty of Health Sciences<br>Faculty of Natural and Agricultural Sciences<br>Faculty of Theology and Religion<br>Faculty of Veterinary Science |
|------------------------|---|

|                      |                   |
|----------------------|-------------------|
| <b>Prerequisites</b> | No prerequisites. |
|----------------------|-------------------|

|                     |                     |
|---------------------|---------------------|
| <b>Contact time</b> | 2 lectures per week |
|---------------------|---------------------|

|                            |                                |
|----------------------------|--------------------------------|
| <b>Language of tuition</b> | Module is presented in English |
|----------------------------|--------------------------------|

|                   |             |
|-------------------|-------------|
| <b>Department</b> | Informatics |
|-------------------|-------------|

|                               |            |
|-------------------------------|------------|
| <b>Period of presentation</b> | Semester 2 |
|-------------------------------|------------|

### Module content

Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

## Language and study skills 110 (LST 110)

|                       |      |
|-----------------------|------|
| <b>Module credits</b> | 6.00 |
|-----------------------|------|

|                  |    |
|------------------|----|
| <b>NQF Level</b> | 05 |
|------------------|----|

|                        |   |
|------------------------|---|
| <b>Service modules</b> | Faculty of Natural and Agricultural Sciences<br>Faculty of Veterinary Science |
|------------------------|---|

|                      |                   |
|----------------------|-------------------|
| <b>Prerequisites</b> | No prerequisites. |
|----------------------|-------------------|

|                     |                     |
|---------------------|---------------------|
| <b>Contact time</b> | 2 lectures per week |
|---------------------|---------------------|

|                            |                                |
|----------------------------|--------------------------------|
| <b>Language of tuition</b> | Module is presented in English |
|----------------------------|--------------------------------|

|                   |                            |
|-------------------|----------------------------|
| <b>Department</b> | Unit for Academic Literacy |
|-------------------|----------------------------|

|                               |            |
|-------------------------------|------------|
| <b>Period of presentation</b> | Semester 1 |
|-------------------------------|------------|

### Module content

The module aims to equip students with the ability to cope with the reading and writing demands of scientific disciplines.

## Academic orientation 102 (UPO 102)

|                       |      |
|-----------------------|------|
| <b>Module credits</b> | 0.00 |
|-----------------------|------|

|                  |    |
|------------------|----|
| <b>NQF Level</b> | 00 |
|------------------|----|

|                            |                                |
|----------------------------|--------------------------------|
| <b>Language of tuition</b> | Module is presented in English |
|----------------------------|--------------------------------|

|                   |  |
|-------------------|--|
| <b>Department</b> | Natural and Agricultural Sciences Deans Office |
|-------------------|--|

|                               |      |
|-------------------------------|------|
| <b>Period of presentation</b> | Year |
|-------------------------------|------|

## Core modules

### Biometry 120 (BME 120)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 16.00   |
| <b>NQF Level</b>              | 05  |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology<br>Faculty of Natural and Agricultural Sciences<br>Faculty of Veterinary Science |
| <b>Prerequisites</b>          | At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123   |
| <b>Contact time</b>           | 1 practical per week, 4 lectures per week   |
| <b>Language of tuition</b>    | Module is presented in English  |
| <b>Department</b>             | Statistics  |
| <b>Period of presentation</b> | Semester 2  |

#### Module content

Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and twoway designs, randomised blocks. Multiple statistical analysis: Bivariate data sets: Curve fitting (linear and non-linear), growth curves. Statistical inference in the simple regression case. Categorical analysis: Testing goodness of fit and contingency tables. Multiple regression and correlation: Fitting and testing of models. Residual analysis. Computer literacy: Use of computer packages in data analysis and report writing.

### Plants and society 161 (BOT 161)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 8.00   |
| <b>NQF Level</b>              | 05   |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology<br>Faculty of Education |
| <b>Prerequisites</b>          | MLB 111 GS   |
| <b>Contact time</b>           | 2 lectures per week, fortnightly practicals  |
| <b>Language of tuition</b>    | Module is presented in English   |
| <b>Department</b>             | Department of Plant and Soil Sciences  |
| <b>Period of presentation</b> | Semester 2   |

## Module content

Botanical principles of structure and function; diversity of plants; introductory plant systematics and evolution; role of plants in agriculture and food security; principles and applications of plant biotechnology; economical and valuable medicinal products derived from plants; basic principles of plant ecology and their application in conservation and biodiversity management.

This content aligns with the United Nation's Sustainable Development Goals of No Poverty, Good Health and Well-being, Climate Action, Responsible Consumption and Production, and Life on Land.

## General chemistry 117 (CMY 117)

**Module credits** 16.00

**NQF Level** 05

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

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

**Contact time** 1 practical per week, 4 lectures per week

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

**Department** Chemistry

**Period of presentation** Semester 1

## Module content

General introduction to inorganic, analytical and physical chemistry. Atomic structure and periodicity. Molecular structure and chemical bonding using the VSEOR model. Nomenclature of inorganic ions and compounds. Classification of reactions: precipitation, acid-base, redox reactions and gas-forming reactions. Mole concept and stoichiometric calculations concerning chemical formulas and chemical reactions. Principles of reactivity: energy and chemical reactions. Physical behaviour gases, liquids, solids and solutions and the role of intermolecular forces. Rate of reactions: Introduction to chemical kinetics.

## General chemistry 127 (CMY 127)

**Module credits** 16.00

**NQF Level** 05

**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** 1 practical per week, 4 lectures per week

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





**Department** Chemistry

**Period of presentation** Semester 2

**Module content**

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

**Introductory genetics 161 (GTS 161)**

**Module credits** 8.00

**NQF Level** 05

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

**Prerequisites** MLB 111 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

**Module content**

Chromosomes and cell division. Principles of Mendelian inheritance: locus and alleles, dominance interactions, extensions and modifications of basic principles.. Probability studies. Sex determination and sex linked traits. Pedigree analysis. Genetic linkage and chromosome mapping. Chromosome variation.

**Introduction to microbiology 161 (MBY 161)**

**Module credits** 8.00

**NQF Level** 05

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

**Prerequisites** No prerequisites.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

## Module content

The module will introduce the student to the field of Microbiology. Basic Microbiological aspects that will be covered include introduction into the diversity of the microbial world (bacteria, archaea, eukaryotic microorganisms and viruses), basic principles of cell structure and function, microbial nutrition and microbial growth and growth control. Applications in Microbiology will be illustrated by specific examples i.e. bioremediation, animal-microbial symbiosis, plant-microbial symbiosis and the use of microorganisms in industrial microbiology. Wastewater treatment, microbial diseases and food will be introduced using specific examples.

## Molecular and cell biology 111 (MLB 111)

**Module credits** 16.00

**NQF Level** 05

### Service modules

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

### Prerequisites

A candidate who has passed Mathematics with at least 60% in the Grade 12 examination

### Contact time

1 practical/tutorial per week, 4 lectures per week

### Language of tuition

Module is presented in English

### Department

Biochemistry, Genetics and Microbiology

### Period of presentation

Semester 1

## Module content

Introduction to the molecular structure and function of the cell. Basic chemistry of the cell. Structure and composition of prokaryotic and eukaryotic cells. Ultrastructure and function of cellular organelles, membranes and the cytoskeleton. General principles of energy, enzymes and cell metabolism. Selected processes, e.g. glycolysis, respiration and/or photosynthesis. Introduction to molecular genetics: DNA structure and replication, transcription, translation. Cell growth and cell division.

## Physics for biology students 131 (PHY 131)

**Module credits** 16.00

**NQF Level** 05

### Service modules

Faculty of Education  
Faculty of Health Sciences  
Faculty of Veterinary Science

### Prerequisites

A candidate must have passed Mathematics with at least 60% in the Grade 12 examination

### Contact time

1 discussion class per week, 1 practical per week, 4 lectures per week

### Language of tuition

Module is presented in English

### Department

Physics



**Period of presentation** Semester 1

### Module content

Note: PHY 131 is aimed at students who will not continue with physics. PHY 131 cannot be used as a substitute for PHY 114.

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.

## Mathematics 134 (WTW 134)

**Module credits** 16.00

**NQF Level** 05

**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

### 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.

## Mathematics 165 (WTW 165)

**Module credits** 16.00

**NQF Level** 05

**Service modules** Faculty of Engineering, Built Environment and Information Technology  
Faculty of Education  
Faculty of Economic and Management Sciences  
Faculty of Veterinary Science

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

**Contact time** 1 tutorial per week, 4 lectures per week

|                               |                                     |
|-------------------------------|-------------------------------------|
| <b>Language of tuition</b>    | Module is presented in English      |
| <b>Department</b>             | Mathematics and Applied Mathematics |
| <b>Period of presentation</b> | Semester 2                          |

### Module content

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

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

## Animal diversity 161 (ZEN 161)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 8.00  |
| <b>NQF Level</b>              | 05  |
| <b>Service modules</b>        | Faculty of Education<br>Faculty of Veterinary Science |
| <b>Prerequisites</b>          | No prerequisites.                                     |
| <b>Contact time</b>           | 2 lectures per week, fortnightly practicals           |
| <b>Language of tuition</b>    | Module is presented in English                        |
| <b>Department</b>             | Zoology and Entomology                                |
| <b>Period of presentation</b> | Semester 2  |

### 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 in various animal phyla. In-class discussion will address the sustainable development goals #3, 12, 13, 14 and 15 (Good Health and Well-being. Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land).

## Curriculum: Year 2

**Minimum credits: 144**

Core modules = 96

Elective modules = 48

### Additional information:

#### Single major track:

- **Applied Microbiology option:** Students must take BOT 251 and either FST 250 or ZEN 251 in the first semester, and must choose any two electives from BCM 261, BOT 261, FST 260, PLG 262 or ZEN 261 in the second semester.
- **Medical Microbiology option:** Students must take FLG 211 and FLG 212 in the first semester, and must choose any two electives from BCM 261, FLG 221 or FLG 222 in the second semester.
- Students must ensure that their selection of electives will meet the prerequisites for the modules they plan to take in the third year.

#### Dual major track:

- **Microbiology and Biochemistry combination:** Students must take BCM 261, CMY 282, CMY 283, CMY 284.
- **Microbiology and Genetics combination:** Students must take BOT 251, BOT 261, ZEN 251 and either PLG 262 or ZEN 261.
- **Microbiology and Plant Science option:** Students must take BOT 251, BOT 261, ZEN 251 and either PLG 262 or ZEN 261.

## Core modules

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00                                    |
| <b>NQF Level</b>              | 06                                       |
| <b>Service modules</b>        | Faculty of Health Sciences               |
| <b>Prerequisites</b>          | CMY 117 GS and CMY 127 GS and MLB 111 GS |
| <b>Contact time</b>           | 1 tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English           |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology  |
| <b>Period of presentation</b> | Semester 1                               |

#### Module content

Structural and ionic properties of amino acids. Peptides, the peptide bond, primary, secondary, tertiary and quaternary structure of proteins. Interactions that stabilise protein structure, denaturation and renaturation of proteins. Introduction to methods for the purification of proteins, amino acid composition, and sequence determinations. Enzyme kinetics and enzyme inhibition. Allosteric enzymes, regulation of enzyme activity, active centres and mechanisms of enzyme catalysis. Examples of industrial applications of enzymes and in clinical pathology as biomarkers of diseases. Online activities include introduction to practical laboratory techniques and Good Laboratory Practice; techniques for the quantitative and qualitative analysis of biological molecules; enzyme activity measurements; processing and presentation of scientific data.



## Carbohydrate metabolism 252 (BCM 252)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00  |
| <b>NQF Level</b>              | 06   |
| <b>Service modules</b>        | Faculty of Education<br>Faculty of Health Sciences |
| <b>Prerequisites</b>          | BCM 251 GS and BCM 257 GS.                         |
| <b>Contact time</b>           | 1 tutorial per week, 2 lectures per week           |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 2   |

### Module content

Carbohydrate structure and function. Blood glucose measurement in the diagnosis and treatment of diabetes. Bioenergetics and biochemical reaction types. Glycolysis, gluconeogenesis, glycogen metabolism, pentose phosphate pathway, citric acid cycle and electron transport. Total ATP yield from the complete oxidation of glucose. A comparison of cellular respiration and photosynthesis. Online activities include techniques for the study and analysis of metabolic pathways and enzymes; PO ratio of mitochondria, electrophoresis, extraction, solubility and gel permeation techniques; scientific method and design.

## Introductory biochemistry 257 (BCM 257)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00                                    |
| <b>NQF Level</b>              | 06                                       |
| <b>Prerequisites</b>          | CMY 117 GS and CMY 127 GS and MLB 111 GS |
| <b>Contact time</b>           | 1 tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English           |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology  |
| <b>Period of presentation</b> | Semester 1                               |

### Module content

Chemical foundations. Weak interactions in aqueous systems. Ionisation of water, weak acids and weak bases. Buffering against pH changes in biological systems. Water as a reactant and function of water. Carbohydrate structure and function. Biochemistry of lipids and membrane structure. Nucleotides and nucleic acids. Other functions of nucleotides: energy carriers, components of enzyme cofactors and chemical messengers. Introduction to metabolism. Bioenergetics and biochemical reaction types. Online activities include introduction to laboratory safety and Good Laboratory Practice; basic biochemical calculations; experimental method design and scientific controls, processing and presentation of scientific data.

## Molecular genetics 251 (GTS 251)

|                       |       |
|-----------------------|-------|
| <b>Module credits</b> | 12.00 |
| <b>NQF Level</b>      | 06    |



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

**Prerequisites** GTS 161 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

#### Module content

The chemical nature of DNA. The processes of DNA replication, transcription, RNA processing, translation. Control of gene expression in prokaryotes and eukaryotes. Recombinant DNA technology and its applications in gene analysis and manipulation.

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

**Module credits** 12.00

**NQF Level** 06

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

**Prerequisites** GTS 251 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

#### Module content

Chromosome structure and transposable elements. Mutation and DNA repair. Genomics and proteomics. Organelle genomes. Introduction to genetic analysis of populations: allele and genotypic frequencies, Hardy Weinberg Law, its extensions and implications for different mating systems. Introduction to quantitative and evolutionary genetics.

### Bacteriology 251 (MBY 251)

**Module credits** 12.00

**NQF Level** 06

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

**Prerequisites** MBY 161 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 1

## Module content

Growth, replication and survival of bacteria, Energy sources, harvesting from light versus oxidation, regulation of catabolic pathways, chemotaxis. Nitrogen metabolism, iron-scavenging. Alternative electron acceptors: denitrification, sulphate reduction, methanogenesis. Bacterial evolution, systematic and genomics. Biodiversity; bacteria occurring in the natural environment (soil, water and air), associated with humans, animals, plants, and those of importance in foods and in the water industry.

## Mycology 261 (MBY 261)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00  |
| <b>NQF Level</b>              | 06   |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology |
| <b>Prerequisites</b>          | MBY 161 GS   |
| <b>Contact time</b>           | 2 lectures per week, Fortnightly practicals/tutorials                |
| <b>Language of tuition</b>    | Module is presented in English                                       |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                              |
| <b>Period of presentation</b> | Semester 2   |

## Module content

Organisation and molecular architecture of fungal thalli, chemistry of the fungal cell. Chemical and physiological requirements for growth and nutrient acquisition. Mating and meiosis; spore development; spore dormancy, dispersal and germination. Fungi as saprobes in soil, air, plant, aquatic and marine ecosystems; role of fungi as decomposers and in the deterioration of materials; fungi as predators and parasites; mycoses, mycetisms and mycotoxicoses; fungi as symbionts of plants, insects and animals. Applications of fungi in biotechnology.

## Food microbiology 262 (MBY 262)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00                                     |
| <b>NQF Level</b>              | 06  |
| <b>Prerequisites</b>          | MBY 251 GS.                               |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology   |
| <b>Period of presentation</b> | Semester 2                                |

## 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.

## Elective modules





## Lipid and nitrogen metabolism 261 (BCM 261)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00                                    |
| <b>NQF Level</b>              | 06                                       |
| <b>Service modules</b>        | Faculty of Health Sciences               |
| <b>Prerequisites</b>          | BCM 251 GS and BCM 257 GS.               |
| <b>Contact time</b>           | 1 tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English           |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology  |
| <b>Period of presentation</b> | Semester 2                               |

### Module content

Biochemistry of lipids, membrane structure, anabolism and catabolism of lipids. Total ATP yield from the complete catabolism of lipids. Electron transport chain and energy production through oxidative phosphorylation. Nitrogen metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neurotransmitters, pigments, hormones and nucleotides from amino acids. Catabolism of purines and pyrimidines. Therapeutic agents directed against nucleotide metabolism. Examples of inborn errors of metabolism of nitrogen containing compounds. The urea cycle, nitrogen excretion. Online activities include training in scientific reading skills; evaluation of a scientific report; techniques for separation analysis and visualisation of biological molecules; hypothesis design and testing, method design and scientific controls.

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

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00                                     |
| <b>NQF Level</b>              | 06  |
| <b>Service modules</b>        | Faculty of Education                      |
| <b>Prerequisites</b>          | BOT 161                                   |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Department of Plant and Soil Sciences     |
| <b>Period of presentation</b> | Semester 1                                |

### Module content

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

## Plant physiology and biotechnology 261 (BOT 261)

|                       |       |
|-----------------------|-------|
| <b>Module credits</b> | 12.00 |
| <b>NQF Level</b>      | 06    |



|                               |   |
|-------------------------------|---|
| <b>Service modules</b>        | Faculty of Education                      |
| <b>Prerequisites</b>          | BOT 161 and CMY 127 GS.                   |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Department of Plant and Soil Sciences     |
| <b>Period of presentation</b> | Semester 2                                |

#### Module content

Nitrogen metabolism in plants; nitrogen fixation in Agriculture; plant secondary metabolism and natural products; photosynthesis and carbohydrate metabolism in plants; applications in solar energy; plant growth regulation and the Green Revolution; plant responses to the environment; developing abiotic stress tolerant and disease resistant plants. Practicals: Basic laboratory skills in plant physiology; techniques used to investigate nitrogen metabolism, carbohydrate metabolism, pigment analysis, water transport in plant tissue and response of plants to hormone treatments.

### Physical chemistry 282 (CMY 282)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00   |
| <b>NQF Level</b>              | 06  |
| <b>Service modules</b>        | Faculty of Education  |
| <b>Prerequisites</b>          | CMY 117 and CMY 127   |
| <b>Contact time</b>           | 1 tutorial per week, 2 practicals per week, 4 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                                  |
| <b>Department</b>             | Chemistry   |
| <b>Period of presentation</b> | Quarter 2   |

#### Module content

Theory: Classical chemical thermodynamics, gases, first and second law and applications, physical changes of pure materials and simple compounds. Phase rule: Chemical reactions, chemical kinetics, rates of reactions.

### Analytical chemistry 283 (CMY 283)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00   |
| <b>NQF Level</b>              | 06  |
| <b>Service modules</b>        | Faculty of Education  |
| <b>Prerequisites</b>          | CMY 117 and CMY 127   |
| <b>Contact time</b>           | 1 tutorial per week, 2 practicals per week, 4 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                                  |
| <b>Department</b>             | Chemistry   |
| <b>Period of presentation</b> | Quarter 3   |

## Module content

Statistical evaluation of data in line with ethical practice, gravimetric analysis, aqueous solution chemistry, chemical equilibrium, precipitation-, neutralisation- and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry. Examples throughout the course demonstrate the relevance of the theory to meeting the sustainable development goals of clean water and clean, affordable energy.

## Organic chemistry 284 (CMY 284)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00   |
| <b>NQF Level</b>              | 06  |
| <b>Service modules</b>        | Faculty of Education  |
| <b>Prerequisites</b>          | CMY 117 and CMY 127   |
| <b>Contact time</b>           | 1 tutorial per week, 2 practicals per week, 4 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                                  |
| <b>Department</b>             | Chemistry   |
| <b>Period of presentation</b> | Quarter 1   |

## Module content

Resonance, conjugation and aromaticity. Acidity and basicity. Introduction to  $^{13}\text{C}$  NMR spectroscopy. Electrophilic addition: alkenes. Nucleophilic substitution, elimination, addition: alkyl halides, alcohols, ethers, epoxides, carbonyl compounds: ketones, aldehydes, carboxylic acids and their derivatives Training in an ethical approach to safety that protects self, others and the environment is integral to the practical component of the course.

## Introductory and neurophysiology 211 (FLG 211)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00  |
| <b>NQF Level</b>              | 06   |
| <b>Service modules</b>        | Faculty of Natural and Agricultural Sciences |
| <b>Prerequisites</b>          | CMY 127 GS and MLB 111 GS                    |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week    |
| <b>Language of tuition</b>    | Module is presented in English               |
| <b>Department</b>             | Physiology                                   |
| <b>Period of presentation</b> | Semester 1                                   |

## Module content

Orientation in physiology, homeostasis, cells and tissue, muscle and neurophysiology, cerebrospinal fluid and the special senses.

Practical work: Practical exercises to complement the theory.

## Circulatory physiology 212 (FLG 212)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00  |
| <b>NQF Level</b>              | 06   |
| <b>Service modules</b>        | Faculty of Natural and Agricultural Sciences |
| <b>Prerequisites</b>          | CMY 127 GS and MLB 111 GS                    |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week    |
| <b>Language of tuition</b>    | Module is presented in English               |
| <b>Department</b>             | Physiology                                   |
| <b>Period of presentation</b> | Semester 1                                   |

### Module content

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

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 12.00  |
| <b>NQF Level</b>              | 06   |
| <b>Service modules</b>        | Faculty of Natural and Agricultural Sciences |
| <b>Prerequisites</b>          | FLG 211 GS and FLG 212 GS                    |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week    |
| <b>Language of tuition</b>    | Module is presented in English               |
| <b>Department</b>             | Physiology                                   |
| <b>Period of presentation</b> | Semester 2                                   |

### Module content

Structure, gas exchange and non-respiratory functions of the lungs; structure, excretory and non-urinary functions of the kidneys, acid-base balance, as well as the skin and body temperature control. Practical work: Practical exercises to complement the theory.

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

|                            |  |
|----------------------------|--|
| <b>Module credits</b>      | 12.00  |
| <b>NQF Level</b>           | 06   |
| <b>Service modules</b>     | Faculty of Natural and Agricultural Sciences |
| <b>Prerequisites</b>       | FLG 211 GS and FLG 212 GS                    |
| <b>Contact time</b>        | 1 practical per week, 2 lectures per week    |
| <b>Language of tuition</b> | Module is presented in English               |
| <b>Department</b>          | Physiology                                   |

**Period of presentation** Semester 2

**Module content**

Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems.  
Practical work: Practical exercises to complement the theory.

**Introduction to food science and technology 250 (FST 250)**

**Module credits** 12.00

**NQF Level** 06

**Prerequisites** CMY 117 and CMY 127 and PHY 131 and WTW 134 or WTW 165 or permission from the HOD.

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

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

**Department** Consumer and Food Sciences

**Period of presentation** Semester 1

**Module content**

Lectures: Food Science as a discipline. Activities of Food Scientists and Nutritionists. How food is produced, processed and distributed (food pipeline). World food problem. Human nutrition and human food requirements. Constituents of foods: Functional properties. Food quality. Food deterioration and control (food preservation). Unit operations in food processing. Food safety, risks and hazards. Principles of food packaging. Food legislation and labelling. Food processing and the environment. The aforementioned lectures focus on the role of Food Science in addressing the UN Sustainable Development Goals (#1, 2, 3, 6 and 7). Practicals: Group assignments applying the theory in practice; practical demonstrations in pilot plants; guest lecturers on the world of food scientists and nutritionists; factory visit/videos of food processing.

**Principles of food processing and preservation 260 (FST 260)**

**Module credits** 12.00

**NQF Level** 06

**Prerequisites** CMY 117, CMY 127, MBY 161, PHY 131 and WTW 134 or WTW 165 or permission from the HOD.

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

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

**Department** Consumer and Food Sciences

**Period of presentation** Semester 1 and Semester 2

## Module content

Lectures: Food preservation technologies: concept of hurdle technology; heat (blanching, pasteurisation and sterilisation); cold (refrigeration and freezing); concentration and dehydration; food irradiation; fermentation; preservatives; new methods of food preservation. Effect of various food preservation technologies on the microbiological (shelf-life and safety issues), sensory and nutritional quality of foods. Practicals: Practical applications of above processes. Physical, chemical and sensory evaluation of processed foods. Assignment: Application of hurdle technology concept to a specific food product.

## Principles of plant pathology 262 (PLG 262)

**Module credits** 12.00

**NQF Level** 06

**Prerequisites** MBY 161 GS

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 2

## Module content

Fundamental principles of plant pathology. The concept of disease in plants. Causes of plant diseases. Stages in development of plant diseases. Disease cycles and selected examples relevant to Africa. Diagnosis of plant diseases and the sustainable development goals that articulate with plant pathology.

## Invertebrate biology 251 (ZEN 251)

**Module credits** 12.00

**NQF Level** 06

**Service modules** Faculty of Education

**Prerequisites** ZEN 161 GS

**Contact time** 1 practical per week, 4 lectures per week

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

**Department** Zoology and Entomology

**Period of presentation** Quarter 1

## Module content

Origin and extent of modern invertebrate diversity; parasites of man and domestic animals; biology and medical importance of arachnids and insects; insect life styles; the influence of the environment on insect life histories; insect herbivory; predation and parasitism; insect chemical, visual, and auditory communication. Examples used in the module are relevant to the sustainable development goals of Life on Land and Good Health and Well-being.

## African vertebrates 261 (ZEN 261)



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|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 12.00                                     |
| <b>NQF Level</b>              | 06  |
| <b>Service modules</b>        | Faculty of Education                      |
| <b>Prerequisites</b>          | ZEN 161 GS                                |
| <b>Contact time</b>           | 1 practical per week, 4 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Zoology and Entomology                    |
| <b>Period of presentation</b> | Quarter 3                                 |

### Module content

Introduction to general vertebrate diversity; African vertebrate diversity; vertebrate structure and function; vertebrate evolution; vertebrate relationships; aquatic vertebrates; terrestrial ectotherms; terrestrial endotherms; vertebrate characteristics; classification; structural adaptations; habits; habitats; conservation problems; impact of humans on other vertebrates. The module addresses the sustainable development goals of Life below Water and Life on Land.

## Curriculum: Final year

**Minimum credits: 144**

Core modules = 72

Elective modules = 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)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | MBY 251 GS   |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 1   |

#### Module content

Introduction to the viruses as a unique kingdom inclusive of their different hosts, especially bacteria, animals and plants; RNA and DNA viruses; viroids, tumour viruses and oncogenes, mechanisms of replication, transcription and protein synthesis; effect on hosts; viral immunology; evolution of viruses.

### Bacterial genetics 355 (MBY 355)

|                            |  |
|----------------------------|--|
| <b>Module credits</b>      | 18.00  |
| <b>NQF Level</b>           | 07   |
| <b>Prerequisites</b>       | MBY 251 GS, GTS 251 GS and GTS 261 GS.             |
| <b>Contact time</b>        | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b> | Module is presented in English                     |



**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

### Module content

DNA replication and replication control. DNA recombination. DNA damage and repair. Genetics of bacteriophages, plasmids and transposons. Bacterial gene expression control at the transcriptional, translational and post-translational levels. Global regulation and compartmentalisation.

## Genetic manipulation of microbes 364 (MBY 364)

**Module credits** 18.00

**NQF Level** 07

**Prerequisites** MBY 251 and GTS 251

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

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

## Microbe interactions 365 (MBY 365)

**Module credits** 18.00

**NQF Level** 07

**Prerequisites** MBY 251 and MBY 355 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

Interactions between microbes and their abiotic environment; microbial interaction with other strains of the same and other species; microbial interactions across kingdoms; pathogenic interactions between microbes and plant or animal hosts; mutualistic interactions between microbes and their hosts; introduction to systems biology.



## Elective modules

### Macromolecules of life: structure-function and bioinformatics 356 (BCM 356)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | BCM 251 GS and BCM 257 GS and BCM 261 GS and BCM 252 GS. |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week       |
| <b>Language of tuition</b>    | Module is presented in English                           |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                  |
| <b>Period of presentation</b> | Semester 1   |

#### Module content

Structure, function, bioinformatics and biochemical analysis of (oligo)nucleotides, amino acids, proteins and ligands – and their organisation into hierarchical, higher order, interdependent structures. Principles of structure-function relationships, protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications. Molecular recognition between proteins, ligands, DNA and RNA or any combinations. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Basic principles of mass spectrometry, nuclear magnetic resonance spectroscopy, X-ray crystallography and proteomics. Protein purification and characterisation including, pI, molecular mass, amino acid composition and sequence. Mechanistic aspects and regulation of information flow from DNA via RNA to proteins and back. Practical training includes hands-on nucleic acid purification and sequencing, protein production and purification, analysis by SDS-PAGE or mass spectrometry, protein structure analysis and 3D protein modelling.

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | BCM 251 GS and BCM 257 GS and BCM 261 GS and BCM 252 GS. |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week       |
| <b>Language of tuition</b>    | Module is presented in English                           |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                  |
| <b>Period of presentation</b> | Semester 1   |

#### Module content

Regulation of metabolic pathways. Analysis of metabolic control. Elucidation of metabolic pathways with isotopes. Metabolomics. Coordinated regulation of glycolysis/gluconeogenesis and glycogen breakdown/synthesis. Overview of hormone action. Metabolism of xenobiotics. Hormonal regulation of fuel metabolism. Metabolic adaptations during diabetes. Obesity and the regulation of body mass. Obesity, metabolic syndrome and Type 2 diabetes (T2D). Management of T2D with diet, exercise and medication. Practical sessions cover tutorials on case studies and biochemical calculations, and hands-on isolation of an enzyme, determination of pH and temperature optima, determination of  $K_m$  and  $V_{max}$ , enzyme activation and enzyme inhibition.

## Cell structure and function 367 (BCM 367)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | BCM 251 and BCM 257 and BCM 261 GS and BCM 252 GS. |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 2   |

### Module content

Visualising cell structure and localisation of proteins within cells. Cell ultrastructure. Purification of subcellular organelles. Culturing of cells. Biomembrane structure. Transmembrane transport of ions and small molecules and the role of these processes in disease. Moving proteins into membranes and organelles. Vesicular traffic, secretion, exocytosis and endocytosis. Cell organisation and movement motility based on the three types of cytoskeletal structures including microfilaments, microtubules and intermediate filaments as well as their associated motor proteins. Cell-cell and cell-matrix adhesion through corresponding proteins and morphological structures. Practical training includes tutorials on cytometry and microscopy, mini-research projects where students are introduced and guided through aspects of research methodology, experimental planning techniques associated with cellular assays, buffer preparation, active transport studies in yeast cells, structure-function analyses of actin and binding partners.

## Molecular basis of disease 368 (BCM 368)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | BCM 251 and BCM 257 and BCM 261 GS BCM 252 GS.     |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 2   |

### Module content

Molecular mechanisms behind exogenous and endogenous diseases. Foundational knowledge of the immune system, with innate-, adaptive- and auto-immunity (molecular mechanisms of the maintenance and failure of the recognition of foreign in the context of self in the mammalian body) being some of the key concepts. Molecular pathology and immunobiochemistry of exogenous diseases against viral, bacterial and parasitic pathogens with a focus on the human immunodeficiency virus (HIV), tuberculosis (TB) and malaria. Endogenous disease will describe the biochemistry of normal cell cycle proliferation, quiescence, senescence, differentiation and apoptosis, and abnormal events as illustrated by cancer. Tutorials will focus on immunoassays, vaccines, diagnostic tests for diseases and drug discovery towards therapeutics.

## Plant ecophysiology 356 (BOT 356)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 18.00                                     |
| <b>NQF Level</b>              | 07  |
| <b>Service modules</b>        | Faculty of Education                      |
| <b>Prerequisites</b>          | BOT 161                                   |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Department of Plant and Soil Sciences     |
| <b>Period of presentation</b> | Semester 1                                |

### Module content

Introduction to plant ecophysiology and plants response to environmental stress. Understanding how various biotic and abiotic factors affect plant metabolic processes, including photosynthesis and respiration. Emphasis is placed on the efficiency of the mechanisms whereby C3-, C4 and CAM-plants bind CO<sub>2</sub> and how they are impacted by the environment. To understand the functioning of plants in diverse environments, the relevant structural properties of plants, the impact of soil composition, water flow in the soil-plant air continuum and long distance transport of assimilates will be discussed. Students will research a topic relevant to plant ecophysiology and present this in the form of an oral presentation. Students will conduct a practical project to study the effects of environmental factors on C3 and C4 plant growth and physiology. Students will present the report in a written format according to the guidelines of a relevant scientific journal. Relevant readings will be used to highlight the alignment of the module with the Sustainable Development Goals, with emphasis placed on climate action.

## Plant ecology 358 (BOT 358)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 18.00   |
| <b>NQF Level</b>              | 07  |
| <b>Prerequisites</b>          | BOT 161 and BOT 251.  |
| <b>Contact time</b>           | 1 practical per week, 2 days field-based practical, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English  |
| <b>Department</b>             | Department of Plant and Soil Sciences                                   |
| <b>Period of presentation</b> | Semester 1  |

### Module content

Theory of plant community concepts, floristic and structural composition, plant diversity, ecological succession, landscape ecology. Data processing techniques. Species interactions and an evaluation of their effects on interacting species. Fundamentals of plant population biology: life tables; plant breeding systems and pollination; population dynamics; life history strategies; intraspecific competition; interspecific competition and co-existence. There is a compulsory field-based practical run over a weekend in the first month of the first semester.

## Phytomedicine 365 (BOT 365)

|                       |       |
|-----------------------|-------|
| <b>Module credits</b> | 18.00 |
|-----------------------|-------|



|                               |   |
|-------------------------------|---|
| <b>NQF Level</b>              | 07  |
| <b>Service modules</b>        | Faculty of Education                      |
| <b>Prerequisites</b>          | BOT 161                                   |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Department of Plant and Soil Sciences     |
| <b>Period of presentation</b> | Semester 2                                |

### Module content

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

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology |
| <b>Prerequisites</b>          | GTS 251 and {GTS 261 GS or BOT 261}                                  |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week                   |
| <b>Language of tuition</b>    | Module is presented in English                                       |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                              |
| <b>Period of presentation</b> | Semester 2   |

## Module content

Plant genetics and genomics: gene control in plants, epigenetics, co-suppression, forward and reverse genetics, structural and functional genomics. Plant development: flowering, genetics imprinting. Plant-environment interactions. Crop genetic modification: food security, GMO regulation, plant transformation, whole-chromosome transformation, synthetic biology, homologous recombination. Crop molecular markers: marker types, genotyping, QTL mapping, marker-assisted breeding. Future of crop biotechnology: applications of genomics, biopharming, genetical genomics, systems biology

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | FST 260, MBY 251, MBY 261, MBY 262                 |
| <b>Contact time</b>           | 180 minute practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Consumer and Food Sciences                         |
| <b>Period of presentation</b> | Semester 1   |

## Module content

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

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

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | GTS 251 GS and GTS 261 GS                          |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 1   |

## Module content

Regulation of gene expression in eukaryotes: regulation at the genome, transcription, RNA processing and translation levels. DNA elements and protein factors involved in gene control. The role of chromatin structure and epigenetic changes. Technology and experimental approaches used in studying eukaryotic gene control. Applications of the principles of gene control in eg cell signaling pathways, development cancer and other diseases in humans.

## Genome evolution and phylogenetics 354 (GTS 354)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology |
| <b>Prerequisites</b>          | GTS 251 and GTS 261 GS   |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week                   |
| <b>Language of tuition</b>    | Module is presented in English                                       |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                              |
| <b>Period of presentation</b> | Semester 2   |

## Module content

A unifying framework for biology. Mechanisms involved in the evolution of genes, genomes and species. Comparative genomics across the kingdoms of life. Phylogenetic inference. Applications of phylogenetics and evolutionary genomics research, including relevance to sustainable development goals for food security, good health and the biosphere.

## Population and evolutionary genetics 367 (GTS 367)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Service modules</b>        | Faculty of Engineering, Built Environment and Information Technology |
| <b>Prerequisites</b>          | GTS 251 GS and GTS 261 GS.   |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week                   |
| <b>Language of tuition</b>    | Module is presented in English                                       |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology                              |
| <b>Period of presentation</b> | Semester 1   |

## Module content

Processes that affect genetic evolution: mutation, drift, natural selection and recombination. Fisher-Wright and coalescence models. Groupings of genes: linkage, inbreeding, population structure and gene flow. Neutral and nearly neutral theory. Quantitative genetics and the phenotype. Optimality. Adaptation. Levels of selection in sex ratios and conflict. Reproductive value and life history. Relatedness and kin selection. Sexual reproduction and selection. Genomic complexity and neutrality.



## Genetics in human health 368 (GTS 368)

|                               |  |
|-------------------------------|--|
| <b>Module credits</b>         | 18.00  |
| <b>NQF Level</b>              | 07   |
| <b>Prerequisites</b>          | GTS 251 and GTS 261 GS                             |
| <b>Contact time</b>           | 1 practical/tutorial per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English                     |
| <b>Department</b>             | Biochemistry, Genetics and Microbiology            |
| <b>Period of presentation</b> | Semester 2   |

### Module content

Application of modern genetics to human variability, health and disease. Molecular origin of Mendelian and multifactorial diseases. The use of polymorphisms, gene mapping, linkage and association studies in medical genetics. Genetic diagnosis: application of cytogenetic, molecular and genomic techniques. Congenital abnormalities, risk assessment and genetic consultation. Prenatal testing, population screening, treatment of genetic diseases and gene-based therapy. Pharmacogenetics and cancer genetics. Ethical aspects in medical genetics.

## General plant pathology 351 (PLG 351)

|                               |   |
|-------------------------------|---|
| <b>Module credits</b>         | 18.00                                     |
| <b>NQF Level</b>              | 07  |
| <b>Prerequisites</b>          | MBY 161 and PLG 262                       |
| <b>Contact time</b>           | 1 practical per week, 2 lectures per week |
| <b>Language of tuition</b>    | Module is presented in English            |
| <b>Department</b>             | Department of Plant and Soil Sciences     |
| <b>Period of presentation</b> | Semester 1                                |

### Module content

Principles and examples of plant diseases and their socio-economic importance particularly in the context of Africa and South Africa. Pathogens causing disease of seeds, seedlings, foliage, roots, stems, grains and fruit. Diagnosis, symptom expression and selected disease cycle examples caused by fungi, bacteria, viruses and nematodes.

## Insect diversity 355 (ZEN 355)

|                            |  |
|----------------------------|--|
| <b>Module credits</b>      | 18.00                                      |
| <b>NQF Level</b>           | 07   |
| <b>Service modules</b>     | Faculty of Education                       |
| <b>Prerequisites</b>       | ZEN 251 GS                                 |
| <b>Contact time</b>        | 2 practicals per week, 4 lectures per week |
| <b>Language of tuition</b> | Module is presented in English             |



**Department** Zoology and Entomology

**Period of presentation** Quarter 1

### Module content

The extent and significance of insect diversity. Functional insect morphology. The basic principles of taxonomy and the classification of taxa within the Insecta. Insect orders and economically and ecologically important Southern African insect families. Identification of insect orders and families using distinguishing characteristics. General biological and behavioural characteristics of each group. Grouping of insects into similar life-styles and habitats. Examples used in this module are directly relevant to the sustainable development goals of Good Health and Well-being, Sustainable Cities and Communities, Climate Action and Life on Land.

## Applied entomology 365 (ZEN 365)

**Module credits** 18.00

**NQF Level** 07

**Service modules** Faculty of Education

**Prerequisites** No prerequisites.

**Contact time** 2 practicals per week, 4 lectures per week

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

**Department** Zoology and Entomology

**Period of presentation** Quarter 4

### Module content

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, analysis, interpretation and reporting of applied entomological research. Examples used in this module are directly relevant to the sustainable development goals of Life on Land, No Poverty, Zero Hunger and Good Health and Well-being.

## Regulations and rules

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

The [General Academic Regulations \(G Regulations\)](#) and [General Student Rules](#) apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific

regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations.

**University of Pretoria Programme Qualification Mix (PQM) verification project**

The higher education sector has undergone an extensive alignment to the Higher Education Qualification Sub-Framework (HEQF) across all institutions in South Africa. In order to comply with the HEQSF, all institutions are legally required to participate in a national initiative led by regulatory bodies such as the Department of Higher Education and Training (DHET), the Council on Higher Education (CHE), and the South African Qualifications Authority (SAQA). The University of Pretoria is presently engaged in an ongoing effort to align its qualifications and programmes with the HEQSF criteria. Current and prospective students should take note that changes to UP qualification and programme names, may occur as a result of the HEQSF initiative. Students are advised to contact their faculties if they have any questions.