

# University of Pretoria Yearbook 2020

## BSc Biotechnology (02133403)

**Minimum duration of study** 3 years

**Total credits** 428

**NQF level** 07

### Admission requirements

- The closing date is an administrative admission guideline for non-selection programmes. Once a non-selection programme is full and has reached the institutional targets, then that programme will be closed for further admissions, irrespective of the closing date. However, if the institutional targets have not been met by the closing date, then that programme will remain open for admissions until the institutional targets are met.
- The following persons will be considered for admission: candidates who are in possession of a certificate that is deemed by the University to be equivalent to the required National Senior Certificate with university endorsement, candidates who are graduates from another tertiary institution or have been granted the status of a graduate of such an institution, and candidates who are graduates of another faculty at the University of Pretoria.
- Life Orientation is excluded from 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 Grade 12 results.
- Please note that the Faculty does not accept GED and School of Tomorrow qualifications for entry into our programmes.

### Transferring students

- **Candidates previously registered at UP or at another university**
  - The faculty's Admissions Committee considers applications of candidates who have already completed the final NSC or equivalent qualification examination and/or were previously registered at UP or another university, on grounds of their final NSC or equivalent qualification results as well as academic merit.
- **Candidates previously registered at a FET college or a university of technology**
  - The faculty's Admissions Committee considers the application of these candidates on the grounds of their final NSC or equivalent qualification results as well as academic merit.

### Qualifications from countries other than South Africa

- Citizens from countries other than South Africa and South African citizens with foreign qualifications must comply with all the other admission requirements and the prerequisites for subjects/modules.
- Candidates must have completed the National Senior Certificate with admission to degree studies or a certificate of conditional exemption on the basis of a candidate's foreign qualifications, the so-called "Immigrant" or "Foreign Conditional Exemption". The only condition for the "Foreign Conditional Exemption" that is accepted is: 'completion of the degree course'. The exemption certificate is obtainable from Universities South Africa (USAf). Detailed information is available on the website at [click here](#).

**University of Pretoria website:** [click here](#)

**National Benchmark Test website:** [click here](#)

### Minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

		Mathematics		Physical Sciences		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	<b>32</b>

\* Cambridge A level candidates who obtained at least a D in the required subjects, will be considered for admission. Students in the Cambridge system must offer both Physics AND Chemistry with performance at the level specified for NSC Physical Sciences in the table above.

\* International Baccalaureate (IB) HL candidates who obtained at least a 4 in the required subjects, will be considered for admission. Students in the IB system must offer both Physics AND Chemistry with performance at the level specified for NSC Physical Sciences in the table above.

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

### BSc - Extended Programme - Biological and Agricultural Sciences

#### Minimum requirements

#### Achievement level

#### English Home

#### Language or

#### English First

#### Additional

#### Language

		Mathematics		Physical Sciences		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	<b>26</b>

## Other programme-specific information

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

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

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

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

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

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

It remains the student's responsibility to 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 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.

## 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**

Fundamental modules = 12

Core modules = 128

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

### Fundamental modules

#### Academic information management 102 (AIM 102)

<b>Module credits</b>	6.00
<b>Service modules</b>	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
<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>	Information Science
<b>Period of presentation</b>	Semester 2

#### Module content

Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology. Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

#### Academic information management 111 (AIM 111)

<b>Module credits</b>	4.00
<b>Service modules</b>	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
<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	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

**Service modules**

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

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

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

**Department** Informatics

**Period of presentation** Semester 2

### Module content

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

## Language and study skills 110 (LST 110)

**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

### 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>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>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Natural and Agricultural Sciences 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.

### Plant biology 161 (BOT 161)

<b>Module credits</b>	8.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology 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

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.

## General chemistry 117 (CMY 117)

**Module credits** 16.00

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

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

**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

**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

**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

**Service modules** Faculty of Education  
Faculty of Health Sciences  
Faculty of Veterinary Science

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

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

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

**Department** Physics

**Period of presentation** Semester 1

### Module content

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

## Mathematics 134 (WTW 134)

**Module credits** 16.00

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

<b>Prerequisites</b>	50% for Mathematics in Grade 12
<b>Contact time</b>	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 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)

<b>Module credits</b>	16.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Veterinary Science
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<b>Prerequisites</b>	50% for Mathematics in Grade 12 and MGW 112# or registered for BVSc
<b>Contact time</b>	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
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<b>Service modules</b>	Faculty of Education 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 = 108

Elective = 36

### Additional information:

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

### Please note:

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

## Core modules

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

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

#### Module content

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

### Carbohydrate metabolism 252 (BCM 252)

Module credits	12.00
Service modules	Faculty of Education Faculty of Health Sciences
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

### Module content

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

## Lipid and nitrogen metabolism 261 (BCM 261)

**Module credits** 12.00

**Service modules** Faculty of Health Sciences

**Prerequisites** BCM 251 GS and BCM 252 GS.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

Biochemistry of 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. Practical training in scientific reading skills: evaluation of a scientific report. Techniques for separation analysis and visualisation of biological molecules. Hypothesis design and testing, method design and scientific controls.

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

**Module credits** 12.00

**Service modules** Faculty of Education

**Prerequisites** BOT 161

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 1



## Module content

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>Service modules</b>	Faculty of Education
<b>Prerequisites</b>	BOT 161 and CMY 127.
<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.

## Molecular genetics 251 (GTS 251)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	GTS 161 GS
<b>Contact time</b>	2 lectures per week, fortnightly tutorials
<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

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)

<b>Module credits</b>	12.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
<b>Prerequisites</b>	GTS 251 GS
<b>Contact time</b>	2 lectures per week, fortnightly 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

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)

<b>Module credits</b>	12.00
<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
<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

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>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.

## Elective modules

### Biochemical principles of nutrition and toxicology 262 (BCM 262)

<b>Module credits</b>	12.00
<b>Service modules</b>	Faculty of Health Sciences
<b>Prerequisites</b>	BCM 251 GS and BCM 252 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 nutrition and toxicology. Proximate analysis of nutrients. Review of energy requirements and expenditure, starvation, marasmus and kwashiorkor. Respiratory quotient. Requirements and function of water, vitamins and minerals. Interpretation and modification of RDA values for specific diets, eg growth, exercise, pregnancy and lactation, aging and starvation. Interactions between nutrients. Cholesterol, polyunsaturated, essential fatty acids and dietary anti-oxidants. Oxidation of fats. Biochemical mechanisms of water- and fat-soluble vitamins and assessment of vitamin status. Mineral requirements, biochemical mechanisms, imbalances and diarrhoea. Biochemistry of xenobiotics: absorption, distribution, metabolism and excretion (ADME); detoxification reactions: oxidation/reduction (Phase I), conjugations (Phase II), export from cells (Phase III); factors affecting metabolism and disposition. Examples of genetic abnormalities, phenotypes and frequencies. Examples of toxins: biochemical mechanisms of common toxins and their antidotes. Natural toxins from fungi, plants and animals: goitrogens, cyanogens, cholinesterase inhibitors, ergotoxin, aflatoxins. Practical training in scientific writing skills: evaluating scientific findings. Introduction to practical techniques in nutrition and toxicology. Experimental design and calculations in experiments: determining nutritional value of metabolites and studying the ADME of toxins.

### Biometry 210 (BME 210)

<b>Module credits</b>	24.00
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	BME 120
<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

**Period of presentation** Semester 1

### Module content

Analysis of variance: Multi-way classification. Testing of model assumptions, graphics. Multiple comparisons. Fixed, stochastic and mixed effect models. Block experiments. Estimation of effects. Experimental design: Principles of experimental design. Factorial experiments: Confounding, single degree of freedom approach, hierarchical classification. Balanced and unbalanced designs. Split-plot designs. Analysis of covariance. Computer literacy: Writing and interpretation of computer programmes. Report writing.

## Animal anatomy and physiology 200 (DAF 200)

**Module credits** 32.00

**Prerequisites** CMY 127 GS

**Contact time** 1 practical every 2nd week, 4 lectures per week

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

**Department** Animal and Wildlife Sciences

**Period of presentation** Year

### Module content

The body cavities, the origin of trunk wall and the principle arrangement of other anatomical structures as explained by the basic embryological development of mammals. Introduction to anatomy and anatomical terminology. Introduction to basic histology of cells, epithelial tissue and connective tissue. Basic anatomy of tissues, organs, systems and joints. Anatomy of the musculo-skeletal system integrated, the histology of connective tissue and muscles. The anatomy and histology of the integument and skin structures, the cardiovascular, respiratory, immune, endocrine, urogenital and digestive systems all of which serves as basis for the physiology component of the module. General species differences of the anatomy and histology where applicable.

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

**Module credits** 12.00

**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.

## Introductory soil science 250 (GKD 250)

**Module credits** 12.00

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

**Prerequisites** CMY 117 GS

**Contact time** 1 practical per week, 3 lectures per week

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 1

## Module content

Origin and development of soil, weathering and soil formation processes. Profile differentiation and morphology. Physical characteristics: texture, structure, soil water, atmosphere and temperature. Chemical characteristics: clay minerals, ion exchange, pH, buffer action, soil acidification and salinisation of soil. Soil fertility and fertilisation. Soil classification. Practical work: Laboratory evaluation of simple soil characteristics. Field practicals on soil formation in the Pretoria area.

## Food microbiology 262 (MBY 262)

**Module credits** 12.00

**Prerequisites** MBY 251 GS.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

## Module content

Primary sources of 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.

## Introduction to crop protection 251 (PLG 251)

<b>Module credits</b>	12.00
<b>Prerequisites</b>	No prerequisites.
<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

Development and importance of crop protection. Basic principles in crop protection i.e. epidemic development of disease and insect pest populations, ecology of plant diseases and abiotic factors that affect plant health i.e. environmental pollution and pesticides, nutrient deficiencies and extreme environmental conditions. Ecological aspects of plant diseases, pest outbreaks and weed invasion. Important agricultural pests and weeds, globally as well as in African context. Life cycles of typical disease causing organisms. Basic principles of integrated pest and disease management. The importance of crop protection in the context of sustainable development will be highlighted.

## Principles of plant pathology 262 (PLG 262)

<b>Module credits</b>	12.00
<b>Prerequisites</b>	MBY 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

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.

## Sustainable crop production and agroclimatology 251 (PPK 251)

<b>Module credits</b>	15.00
<b>Prerequisites</b>	BOT 161
<b>Contact time</b>	3 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

Influence of climate on cropping systems in South Africa. The surface energy balance. Hydrological cycles and the soil water balance. Sustainable crop production. Simple radiation and water limited models. Potential yield, target yield and maximum economic yield. Crop nutrition and fertiliser management. Principles of soil cultivation and conservation. Climate change and crop production – mitigation and adaptation.

## Invertebrate biology 251 (ZEN 251)

**Module credits** 12.00

**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)

**Module credits** 12.00

**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 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 = 54

Elective = 90

#### To focus your degree in Biochemistry:

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

#### To focus your degree in Genetics:

- Students interested in the PLANT GENETICS option must take GTS 354, BTC 361, GTS367.
- The balance of the electives (36 credits) must be chosen from BCM 367, BOT 356, BOT 358, BOT 365, PLG 351, PLG 363.
- Students interested in the HUMAN / ANIMAL GENETICS option must take GTS 354, GTS 367, GTS 368.
- The balance of the electives (36 credits) must be chosen from BCM 357, BCM 367, BCM 368, MBY 351, MBY 355, MBY 365.

#### To focus your degree in Microbiology:

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

#### To focus your degree in Plant Science:

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

## Core modules

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

Module credits	18.00
Prerequisites	BCM 251 GS and BCM 252 GS and BCM 261 GS
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

## Module content

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.

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

<b>Module credits</b>	18.00
<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.

## Genetic manipulation of microbes 364 (MBY 364)

<b>Module credits</b>	18.00
<b>Prerequisites</b>	MBY 251 and GTS 251
<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

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.

## Elective modules

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

**Module credits** 18.00

**Prerequisites** BCM 251 GS and BCM 252 GS and BCM 261 GS.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

#### Module content

Regulation of metabolic pathways. Analysis of metabolic control. Elucidation of metabolic pathways with isotopes. Metabolomics. Coordinated regulation of glycolysis/gluconeogenesis and glycogen breakdown/synthesis. Enzyme defects in metabolism and consequences. Hormonal regulation and integration of mammalian metabolism. Regulation of fuel metabolism after a meal, period between meals and starvation. 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, 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)

**Module credits** 18.00

**Prerequisites** BCM 251 and BCM 252 and BCM 261 GS.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 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>Prerequisites</b>	BCM 251 and BCM 252 and BCM 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

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>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

The emphasis is on the efficiency of the mechanisms whereby C3-, C4 and CAM-plants bind CO<sub>2</sub> and how it impacted upon by environmental factors. The mechanisms and factors which determine the respiratory conversion of carbon skeletons and how production is affected thereby will be discussed. Insight into the ecological distribution and manipulation of plants for increased production is gained by discussing the internal mechanisms whereby carbon allocation, hormone production, growth, flowering and fruitset are influenced by external factors. To understand the functioning of plants in diverse environments, the relevant structural properties of plants, and the impact of soil composition, water flow in the soil-plant air continuum and long distance transport of assimilates will be discussed. Various important techniques will be used in the practicals to investigate aspects such as water-use efficiency, photosynthesis and respiration of plants.

### Plant ecology 358 (BOT 358)

**Module credits** 18.00

**Prerequisites** BOT 161 and BOT 251.

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 1

## Module content

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

### Phytomedicine 365 (BOT 365)

**Module credits** 18.00

**Service modules** Faculty of Education

**Prerequisites** BOT 161

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 2

## Module content

The module will include a review on the discovery and use of plant medicines and phyto-therapeutically important molecules obtained from plants. Certain aspects of natural product chemistry i.e. the biosynthesis, ecological role and toxicity of the three main classes of secondary compounds; terpenoids, phenolics, and alkaloids are discussed. An introduction to the principles and applications of metabolomics is presented. The role of these natural products in defense against microorganisms and herbivores is reviewed during the module. The importance of ethnobotany and phylogenetics in modern drug discovery from biodiversity will 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 diversity 366 (BOT 366)

**Module credits** 18.00

**Service modules** Faculty of Education

**Prerequisites** BOT 161

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 2

## Module content

Basic principles and methods of plant classification. Sources of plant variation. Modern methods to ascertain evolutionary relationships among plants. The extent and significance of vascular plant diversity. General structural and biological characteristics of evolutionary and ecologically important plant groups. Botanical nomenclature. Plant identification in practice; identification methods, keys, herbaria and botanical gardens. Diagnostic characters for the field identification of trees, wild flowers and grasses. Family recognition of southern African plants. Available literature for plant identification. Methods to conduct floristic surveys. Nature and significance of voucher specimens.

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

**Module credits** 18.00

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

**Prerequisites** GTS 251 and {GTS 261 GS or BOT 261}

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

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

## Genome evolution and phylogenetics 354 (GTS 354)

**Module credits** 18.00

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

**Prerequisites** GTS 251 GS and GTS 261 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

### Module content

Mechanisms involved in the evolution of genes, genomes and phenotypes. Comparison of the molecular organisation of viral, archaea, bacterial and eukaryotic genomes. Genome project design, DNA sequencing methods and annotation. Molecular evolution. Phylogenetic inference. Applications of phylogenetics and evolutionary genomics research, including relevance to sustainable development goals for food security, good health and the biosphere.

## Population and evolutionary genetics 367 (GTS 367)

**Module credits** 18.00

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

**Prerequisites** GTS 251 and GTS 261 GS.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

Genetic and phenotypic variation. Organisation of genetic variation. Random genetic drift. Mutation and the neutral theory. Darwinian selection. Inbreeding, population subdivision and migration. Evolutionary quantitative genetics. Population genomics. Human population genetics. Levels of selection and individuality. Arms races and irreversibility. Complexity. Applied evolution.



## Genetics in human health 368 (GTS 368)

<b>Module credits</b>	18.00
<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.

## Virology 351 (MBY 351)

<b>Module credits</b>	18.00
<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>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
<b>Department</b>	Biochemistry, Genetics and Microbiology
<b>Period of presentation</b>	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.

### Microbe interactions 365 (MBY 365)

**Module credits** 18.00

**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.

### General plant pathology 351 (PLG 351)

**Module credits** 18.00

**Prerequisites** MBY 161 and PLG 262

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 1

### Module content

Principles and examples of plant diseases and their socio-economic importance particularly in the context of Africa. 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 and how these aspects relate to the sustainable development goals.

### Plant disease control 363 (PLG 363)

**Module credits** 18.00

**Prerequisites** PLG 251 or PLG 262.

**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

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**Period of presentation** Semester 2

**Module content**

Principles of plant disease control and how it resonates with the sustainable development goals. Non-chemical control including biological control, disease resistance, regulatory measures, cultivation practices, physical methods. Modern chemo-therapy: characteristics, mode of action and application of bioproducts, fungicides, bactericides and nematicides. Principles of integrated disease management. The module will also cover applicable South African legislation, the local crop protection industries and the procedure of registering new chemicals.

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