# University of Pretoria Yearbook 2021

# BSc Ecology (02133400)

| | |
|---|---|
| **Department** | Zoology and Entomology |
| **Minimum duration of study** | 3 years |
| **Total credits** | 430 |
| **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.
- In addition to meeting the admission requirements, admission is based on the performance in the **TOEFL**, **IELTS or SAT**, if required.
- 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

| **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 | **32** |

* 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 (Ecology), 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 | **26** |

# Other programme-specific information

Electives are chosen as follows:  Second year – 12 credits

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

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

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

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

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

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

The prerequisites are listed in the Alphabetical list of modules.

# Promotion to next study year

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

**General promotion requirements in the faculty**

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

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations, will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.
- A student who has been excluded from further studies may apply in writing to the Admissions Committee of the Faculty of Natural and Agricultural Sciences for re-admission.
- Should the student be re-admitted by the Admissions Committee, strict conditions will be set which the student must comply with in order to proceed with his/her studies.
- Should the student not be re-admitted to further studies by the Admissions Committee, he/she will be informed in writing.
- Students who are not re-admitted by the Admissions Committee have the right to appeal to the 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: 142**

Fundamental modules = 14
Core modules = 128

## 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<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 |
| **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 |
| **Service modules** | 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 |
| **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 |
| **NQF Level** | 05 |
| **Service modules** | Faculty of Natural and Agricultural Sciences<br>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)

| | |
|---|---|
| **Module credits** | 0.00 |
| **NQF Level** | 00 |
| **Language of tuition** | Module is presented in English |
| **Department** | Natural and Agricultural Sciences Deans Office |
| **Period of presentation** | Year |

## Core modules

### Biometry 120 (BME 120)

| | |
|---|---|
| **Module credits** | 16.00 |
| **NQF Level** | 05 |
| **Service modules** | Faculty of Engineering, Built Environment and Information Technology<br>Faculty of Natural and Agricultural Sciences<br>Faculty of Veterinary Science |
| **Prerequisites** | At least 4 (50-59%) in Mathematics in the Grade 12 examination, or at least 50% in both Statistics 113, 123 |

| | |
|---|---|
| **Contact time** | 1 practical per week, 4 lectures per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Statistics |
| **Period of presentation** | Semester 2 |

**Module content**

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

## Plants and society 161 (BOT 161)

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

**Module content**

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 Debelopment 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<br>Faculty of Education<br>Faculty of Health Sciences<br>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<br>Faculty of Education<br>Faculty of Health Sciences<br>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<br>Faculty of Education<br>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<br>Faculty of Education<br>Faculty of Health Sciences<br>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<br>Faculty of Health Sciences<br>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 |
| **NQF Level** | 05 |
| **Service modules** | Faculty of Engineering, Built Environment and Information Technology<br>Faculty of Education<br>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.

## Animal diversity 161 (ZEN 161)

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

**Module content**

Animal classification, phylogeny 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 = 120
Elective modules = 24

It is the student's responsibility to ensure that no clashes will occur between modules as well as that the necessary prerequisites have been met.

## Core modules

### Biometry 210 (BME 210)

| | |
|---|---|
| **Module credits** | 24.00 |
| **NQF Level** | 06 |
| **Service modules** | Faculty of Natural and Agricultural Sciences |
| **Prerequisites** | BME 120 |
| **Contact time** | 1 practical per week, 4 lectures per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Statistics |
| **Period of presentation** | Semester 1 |

**Module content**

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

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

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **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; centra of plant endemism; rare and threatened plant species; biodiversity conservation and ecosystem management; invasion biology; conservation status of South African vegetation types.

## Plant physiology and biotechnology 261 (BOT 261)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **Service modules** | Faculty of Education |
| **Prerequisites** | BOT 161 and CMY 127. |
| **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**

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.

## Geographic information systems introduction 221 (GIS 221)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **Prerequisites** | Prohibited combination GGY 283 |
| **Contact time** | 1 practical per week, 2 lectures per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Geography Geoinformatics and Meteorology |
| **Period of presentation** | Semester 2 |

**Module content**

Note: Enrolment is limited. Preference will be given based on choice of majors. Students should enquire at the department if they wish to register for the module, but are unable to do so.
*GIS 221 does not lead to admission to any module at 300 level.
Introduction to Geographic Information Systems (GIS), theoretical concepts and applications of GIS. The focus will be on the GIS process of data input, data analysis, data output and associated technologies.This module teaches students to use GIS as a tool. Examples used throughout the course are drawn from South African case studies.

## Introductory soil science 250 (GKD 250)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **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.

## Molecular genetics 251 (GTS 251)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **Service modules** | Faculty of Engineering, Built Environment and Information Technology<br>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<br>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.

## 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)

| | |
|---|---|
| **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 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.

## Elective modules

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

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **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. 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.

### Introductory biochemistry 257 (BCM 257)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **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**

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.

## 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)

| | |
|---|---|
| **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/tutorials |
| **Language of tuition** | Module is presented in English |
| **Department** | Biochemistry, Genetics and Microbiology |
| **Period of presentation** | Semester 2 |

**Module content**

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

## Introduction to crop protection 251 (PLG 251)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **Prerequisites** | No prerequisites. |
| **Contact time** | 1 practical per week, 2 lectures per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Department of Plant and Soil Sciences |
| **Period of presentation** | Semester 1 |

**Module content**

Development and importance of crop protection. Basic principles in crop protection i.e. epidemic development of disease and insect pest populations, ecology of plant diseases and abiotic factors that affect plant health i.e. environmental pollution and pesticides, nutrient deficiencies and extreme environmental conditions. Ecological aspects of plant diseases, pest outbreaks and weed invasion. Important agricultural pests and weeds, 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)

| | |
|---|---|
| **Module credits** | 12.00 |
| **NQF Level** | 06 |
| **Prerequisites** | MBY 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**

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.

# Curriculum: Final year

**Minimum credits: 144**

Core modules = 144

## Core modules

### Plant ecophysiology 356 (BOT 356)

| | |
|---|---|
| **Module credits** | 18.00 |
| **NQF Level** | 07 |
| **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**

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

### Plant ecology 358 (BOT 358)

| | |
|---|---|
| **Module credits** | 18.00 |
| **NQF Level** | 07 |
| **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.

## Plant diversity 366 (BOT 366)

| | |
|---|---|
| **Module credits** | 18.00 |
| **NQF Level** | 07 |
| **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.

## Population ecology 351 (ZEN 351)

| | |
|---|---|
| **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 1 |

**Module content**

Scientific approach to ecology; evolution and ecology; the individual and its environment; population characteristics and demography; competition; predation; plant-herbivore interactions; regulation of populations; population manipulation, human population. Examples throughout the module are relevant to the sustainable development goals of Life on Land and Good Health and Well-being.

## Community ecology 353 (ZEN 353)

| | |
|---|---|
| **Module credits** | 18.00 |
| **NQF Level** | 07 |
| **Service modules** | Faculty of Education |
| **Prerequisites** | ZEN 351 GS or BOT 358 GS |
| **Contact time** | 2 practicals per week, 4 lectures per week |
| **Language of tuition** | Module is presented in English |
| **Department** | Zoology and Entomology |
| **Period of presentation** | Quarter 4 |

**Module content**

The scientific approach; characteristics of the community; the community as a superorganism; community changes; competition as a factor determining community structure; disturbance as a determinant of community structure; community stability; macroecological environmental gradients and communities. A field trip will be conducted during the September vacation to the Sani Pass region of the Maloti- Drakensberg Mountains. The module addresses the sustainable development goals Good Health and Well-being, Sustainable Cities and Communities, Climate Action and Life on Land.

## Evolution and phylogeny 362 (ZEN 362)

| | |
|---|---|
| **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 3 |

**Module content**

This module focuses on micro and macro-evolutionary processes and patterns, from the population level (selection, drift, general population genetics) to clines, subspecies and species. Phylogeography, phylogenetic reconstruction, taxonomy and the genetic and developmental constraints operating at the different levels, are addressed. This module forms the basis for understanding and attaining sustainable development goals 14 and 15 (protection/conservation of aquatic and terrestrial ecosystems), and acknowledges the importance of biodiversity for the sustainability of our own species.

## Behavioural ecology 363 (ZEN 363)

| | |
|---|---|
| **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**

The history of behavioural ecology. A causal, developmental, evolutionary and adaptive approach. Sensory systems and communication. Sexual selection, mate choice and sperm competition. Kin selection and group living. Special reference to social insects. The behavioural ecology of humans. Phylogenetic basis of behavioural analysis. The role of behavioural ecology in conservation planning. The module covers sustainable development goals 1-10 and 12-15.

## Conservation ecology 364 (ZEN 364)

| | |
|---|---|
| **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 2 |

**Module content**

This module is intended to provide students with the skills and knowledge that are essential for the conservation of biodiversity. The module focuses on conservation theory and practice (e.g. endangered species, habitat loss, overexploitation, climate change), and has a practical component. In addition, students will generate a multi-media project designed to inform the general public about a key conservation issue.Over the course of the module, students will be exposed to a number of issues that link directly to sustainable development goals Clean Water and Sanitation, Affordable and Clean Energy, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water & Life on Land, and gain valuable theoretical and practical experience in the field of conservation biology.

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.