

University of Pretoria Yearbook 2025

BSc in Human Physiology 4-year programme (02131010)

Department Natural and Agricultural Sciences Dean's Office

Minimum duration of study 4 years

Total credits 516

NQF level 07

Programme information

This is an extended BSc degree programme with a four-year curriculum that is only presented on a full-time basis. It is designed to enable students, who show academic potential, to obtain a BSc degree.

This programme is directed at a general formative education in the natural sciences. It provides the student with a broad academic basis to continue with postgraduate studies and prepares the student for active involvement in a wide variety of career possibilities.

1. Students who are admitted to one of the BSc four-year programmes register for one specific programme.
2. These programmes are followed by students who, as a result of exceptional circumstances, will benefit from an extended programme.
3. Students who do not comply with the normal three-year BSc entrance requirements for study in the Faculty of Natural and Agricultural Sciences, may nevertheless be admitted to the Faculty in one of the BSc four-year programmes. Generally, an extended programme means that the first study year is extended to take two years. The possibility of switching over to other faculties after one or two years in the four-year programmes exists. This depends on selection rules and other conditions stipulated by the other faculties.
4. Applications for admission to the BSc four-year programmes should be submitted in accordance with the UP applications process, with applications considered up to 30 June and in a second round in August/September. Details are obtainable from the Student Administration at the Faculty of Natural and Agricultural Sciences.
5. The rules and regulations applicable to the mainstream study programmes apply mutatis mutandis to the BSc four-year programmes, with exceptions as indicated in the regulations pertaining to the BSc four-year programmes. For instance, students admitted into the BSc four-year programmes must have a National Senior Certificate with admission for degree purposes.

Admission requirements

Important information for all prospective students for 2025

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

Minimum requirements



Achievement level			
English Home Language or English First Additional Language	Mathematics	Physical Sciences	APS
NSC/IEB	NSC/IEB	NSC/IEB	
58%	58%	58%	30

Life Orientation is excluded when calculating the APS.

Applicants currently in Grade 12 must apply with their final Grade 11 (or equivalent) results.

Applicants who have completed Grade 12 must apply with their final NSC or equivalent qualification results.

Please note that meeting the minimum academic requirements does not guarantee admission.

Only students that have completed school in the last two years and have not studied at a tertiary institution will be considered for this programme.

Successful candidates will be notified once admitted or conditionally admitted.

Unsuccessful candidates will also be notified.

Applicants should check their application status regularly on the UP Student Portal at [click here](#).

Applicants with qualifications other than the abovementioned should refer to the International undergraduate prospectus 2025: Applicants with a school leaving certificate not issued by Umalusi (South Africa), available at [click here](#).

International students: [Click here](#).

Examinations and pass requirements

Academic promotion requirements

Students who do not show progress during the first semester of the first year will be referred to the Admissions Committee of the Faculty.

It is expected of students who register for the first year of the BSc four-year programmes to pass all the prescribed modules of the first year.

Progression requirement

The first year is foundational to the mainstream modules that follow; students will be limited to repeating two foundation modules during year 2 of study. Students may apply for internal transfers at the end of year 2. Not all mainstream programmes will be accessible; the Faculty's transfer guide will clearly outline all possibilities and the overarching objective will be that approved transfers will not involve adding an additional year of study.

Curriculum: Year 1

Minimum credits: 100

Fundamental = 20

Core = 80

Fundamental modules

Academic information management 111 (AIM 111)

Module credits	4.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Information Science
Period of presentation	Semester 1

Module content

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

Academic information management 121 (AIM 121)

Module credits	4.00
NQF Level	05
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, life and study skills 133 (LST 133)

Module credits 6.00

NQF Level 05

Service modules Faculty of Economic and Management Sciences

Prerequisites Admission into BSc Four-year programme

Contact time 1 lecture per week, Foundation Course, 2 tutorials 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 academic demands of scientific disciplines, with a strong focus on high order thinking skills and academic reading skills and strategies.

Language, life and study skills 143 (LST 143)

Module credits 6.00

NQF Level 05

Service modules Faculty of Engineering, Built Environment and Information Technology
Faculty of Economic and Management Sciences

Prerequisites LST 133

Contact time 2 tutorials per week, 1 lecture per week, Foundation Course

Language of tuition Module is presented in English

Department Unit for Academic Literacy

Period of presentation Semester 2

Module content

The module aims to equip students with the ability to cope with the academic demands of scientific disciplines, with a strong focus on high order thinking skills and academic/scientific writing skills.

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 Dean's Office
Period of presentation	Year

Core modules

Foundational biology 137 (BIO 137)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme
Contact time	1 practical fortnightly, 1 tutorial fortnightly, Foundation Course, 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

In this module, students will embark on a journey to understand the nature and scope of biology, delving into its importance in unravelling the mysteries of life. They will explore the essential characteristics of living organisms, encompassing cellular structure, metabolic processes, growth, reproduction, and adaptation. The scientific method, serving as a structured framework for inquiry, hypothesis formulation, experimentation, and evidence-based conclusion making, will be examined. The molecular basis of life, encompassing carbohydrates, lipids, proteins, and nucleic acids, and their significance in cellular structure and function will be studied. The intricate workings of cells and organelles will be introduced, along with DNA structure and replication. Furthermore, they will explore the complexities of the cell cycle, including mitosis and meiosis, and their important roles in growth, development, and genetic inheritance. Hands-on laboratory activities will include microscope operation, specimen preparation, and techniques for calculating magnification.

Foundational biology 147 (BIO 147)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme
Contact time	1 tutorial fortnightly, Foundation Course, 1 practical fortnightly, 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

In this module, students will explore various aspects of biology and ecology, starting with metabolic pathways like cellular respiration and photosynthesis, elucidating how cells obtain and utilize energy. They will delve into evolutionary principles such as natural selection, adaptation, and speciation, and their role in shaping the diversity of life. The concept of taxonomy will be introduced, clarifying its role in categorizing organisms based on shared characteristics. Additionally, students will explore the tree of life as a visual representation of the evolutionary lineage of all living beings. Ecological concepts such as trophic levels, biodiversity hotspots, and ecosystem services will be discussed to emphasize their critical role in sustaining life on Earth. The module will also showcase Africa's remarkable biodiversity, ranging from its megafauna to its diverse array of plant and microbial life. Students will delve into conservation ecology within the context of Africa, analyzing strategies aimed at preserving biodiversity, addressing human-wildlife conflicts, and fostering sustainable development practices. Lastly, the module will address global challenges such as food security and climate change, examining their profound implications for humanity's future.

Foundational chemistry 137 (CMY 137)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme
Contact time	2 lectures per week, 1 tutorial fortnightly, Foundation Course, 1 practical fortnightly
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

The first semester of foundational chemistry will introduce scientific communication to students in terms of the language of chemistry and necessary mathematical skills. The semester will begin with an in-depth study of dimensional analysis which paves the way for mole concept calculations and complex stoichiometry. Chemical reactions, including equations, types of reactions and redox reactions will round off the first semester of study.

Foundational chemistry 147 (CMY 147)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme.
Contact time	2 lectures per week, Foundation Course, 1 tutorial fortnightly, 1 practical fortnightly
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

The second semester of foundational chemistry will begin with naming, bonding and molecular geometries. Molecular geometry will form the basis for intermolecular forces, phases of matter and different domains of thinking within the chemistry discipline. Thinking on the macroscopic, submicroscopic and representational domains is essential for future scientists. Embedded throughout the course will be a systems thinking approach to chemistry, seeing chemistry as an integral part of a global whole.

Foundational physics 137 (PHY 137)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme.
Contact time	2 lectures per week, 1 practical fortnightly, 1 tutorial fortnightly, Foundation Course
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 1

Module content

This module introduces the fundamental principles and tools of physics. Students will gain mastery in measurement techniques, data analysis through graphical representations, and dimensional analysis to identify hidden relationships. Subsequently, the module focuses on one-dimensional kinematics, emphasizing the concepts of position, velocity, and acceleration. Further exploration delves into longitudinal and transverse waves, investigating their properties and propagation mechanisms. The module then introduces physical optics, exploring the behaviour of light through lenses and the formation of images. Finally, the foundations of thermodynamics are established, focusing on the concepts of heat, temperature, and heat capacity.

Foundational physics 147 (PHY 147)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme.
Contact time	1 tutorial fortnightly, 2 lectures per week, Foundation Course, 1 practical fortnightly
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Building upon the previous semester, vector algebra will be introduced, including notation, addition, coordinate systems, and manipulation of magnitudes and angles. Kinematics expands to two- and three-dimensional motion, providing a comprehensive understanding of real-world scenarios. The core of the module focuses on mechanics, analysing the interplay of forces, inertia, and motion governed by Newton's laws. Concepts of momentum, impulse, and conservation laws are introduced. Further exploration investigates equilibrium of forces, friction, and the dynamics of circular motion. These concepts lead to energy principles including work, kinetic energy, the work-energy theorem and power, potential energy, conservative and non-conservative forces and collisions. The module concludes with an introduction to direct current circuits, exploring the flow of current in resistor-based circuits.

Foundational statistics 137 (STC 137)

Module credits 8.00

NQF Level 05

Prerequisites Admission to relevant programme.

Contact time 2 lectures per week, 1 tutorial per week, Foundation Course

Language of tuition Module is presented in English

Department Statistics

Period of presentation Semester 1

Module content

Data literacy in modern society: fundamental understanding of data and its presentation. Data ethics, importing, cleaning, manipulation and handling. Sources and types of data. Sampling methods and the collection of data. Statistical concepts are demonstrated and interpreted through Excel (practical coding) and simulation within a data science framework.

Foundational statistics 147 (STC 147)

Module credits 8.00

NQF Level 05

Prerequisites Admission to relevant programme.

Contact time 1 tutorial per week, Foundation Course, 2 lectures per week

Language of tuition Module is presented in English

Department Statistics

Period of presentation Semester 2

Module content

Exploratory data analysis: tabulation, data visualisation and descriptive measures of location and dispersion. Introduction to probability and counting techniques. Aims of data analysis: descriptive, inferential and predictive. Statistical concepts are demonstrated and interpreted through Excel (practical coding) and simulation within a data science framework.

Foundational mathematics 137 (WTW 137)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme.
Contact time	2 lectures per week, Foundation Course, 1 tutorial per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

This module serves as an introduction to algebra, functions, sequences, and trigonometry, and it aims to deepen students' conceptual understanding of real numbers, elementary set notation, exponents, radicals, algebraic expressions, fractional expressions, linear and quadratic equations, and inequalities. Coordinate geometry: lines, and circles are discussed. Functions are presented numerically, symbolically, graphically, and verbally, focusing on the definition, notation, piecewise-defined functions, domain and range, graphs, transformations of functions, symmetry, even and odd functions, combining functions, one-to-one functions and inverses, polynomial functions and zeros. Trigonometry: the relationship between degrees and radians measure is discussed, as well as the unit circle, trigonometric functions, fundamental identities, trigonometric graphs, trigonometric identities, double-angle, half-angle formulae, trigonometric equations, and applications.

Foundational mathematics 147 (WTW 147)

Module credits	8.00
NQF Level	05
Prerequisites	Admission to relevant programme.
Contact time	1 tutorial per week, Foundation Course, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

The second-semester mathematics module focuses on the mathematical order of numbers and applications: Arithmetic and geometric sequences and series, summation notation, infinite geometric series, compound interest, annuities and instalments, exponential and logarithmic equations, followed by the laws of logarithms. Furthermore, one-to-one functions are extended to exponential and logarithmic functions. An introduction to calculus focusing on finding limits numerically and graphically, finding limits algebraically, techniques for evaluating limits, and differentiation rules.

Curriculum: Year 2

Minimum credits: 128

Core = 128

Please note: ANA modules can only be taken by BSc (Medical Science) students.

Core modules

Biometry 120 (BME 120)

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

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 two-way 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 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 Development Goals of No Poverty, Good Health and Well-being, Climate Action, Responsible Consumption and Production, and Life on Land.

General chemistry 117 (CMY 117)

Module credits 16.00

NQF Level 05

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

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

Contact time 4 lectures per week, 1 practical 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 VSEPR-model. Nomenclature of inorganic ions and compounds. Classification of reactions: precipitation, acid-base, redox reactions and gas-forming reactions. Mole concept and stoichiometric calculations concerning chemical formulas and chemical reactions. Principles of reactivity: energy and chemical reactions. Physical behaviour gases, liquids, solids and solutions and the role of intermolecular forces. Rate of reactions: Introduction to chemical kinetics.

General chemistry 127 (CMY 127)

Module credits 16.00

NQF Level 05

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

Prerequisites Natural and Agricultural Sciences students: CMY 117 GS or CMY 154 GS Health Sciences students: none

Contact time 1 practical per week, 4 lectures per week



Language of tuition Module is presented in English

Department Chemistry

Period of presentation Semester 2

Module content

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

Introductory genetics 161 (GTS 161)

Module credits 8.00

NQF Level 05

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

Prerequisites MLB 111 GS

Contact time fortnightly tutorials, 2 lectures per week

Language of tuition Module is presented in English

Department Biochemistry, Genetics and Microbiology

Period of presentation Semester 2

Module content

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

Introduction to microbiology 161 (MBY 161)

Module credits 8.00

NQF Level 05

Service modules Faculty of Engineering, Built Environment and Information Technology

Prerequisites No prerequisites.

Contact time 2 lectures per week, fortnightly tutorials

Language of tuition Module is presented in English

Department Biochemistry, Genetics and Microbiology

Period of presentation Semester 2



Module content

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

Molecular and cell biology 111 (MLB 111)

Module credits 16.00

NQF Level 05

Service modules

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

Prerequisites

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

Contact time

4 lectures per week, 1 practical/tutorial per week

Language of tuition

Module is presented in English

Department

Biochemistry, Genetics and Microbiology

Period of presentation

Semester 1

Module content

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

Physics for biology students 131 (PHY 131)

Module credits 16.00

NQF Level 05

Service modules

Faculty of Education
Faculty of Health Sciences
Faculty of Veterinary Science

Prerequisites

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

Contact time

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

Language of tuition

Module is presented in English

Department

Physics

Period of presentation Semester 1

Module content

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

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

Mathematics 134 (WTW 134)

Module credits 16.00

NQF Level 05

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

Prerequisites 50% for Mathematics in Grade 12

Contact time 1 tutorial per week, 4 lectures per week

Language of tuition Module is presented in English

Department Mathematics and Applied Mathematics

Period of presentation Semester 1

Module content

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

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

Animal diversity 161 (ZEN 161)

Module credits 8.00

NQF Level 05

Service modules Faculty of Education
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 3

Minimum credits: 144

Core = 108

Elective = 36

Additional information:

Single major track:

- Students must take BCM 261 as an elective and choose the additional electives from the listed Chemistry, Microbiology, Plant Sciences and Zoology modules.
- 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.

Dual major track:

- **Human Physiology and Biochemistry combination:** Students must take BCM 261, MBY 251 and MBY 261.
- **Human Physiology and Genetics combination:** Students must take BCM 261, MBY 251 and MBY 261.
- **Human Physiology and Microbiology combination:** Students must take MBY 251, MBY 261 and MBY 262.
- **Human Physiology and Pharmacology combination:** Students must take BCM 261 and take other 200-level elective modules (24 credits). No 200-level prerequisites for 300-level Pharmacology modules.

Core 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.

Carbohydrate metabolism 252 (BCM 252)

Module credits 12.00



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

Module content

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

Introductory biochemistry 257 (BCM 257)

Module credits	12.00
NQF Level	06
Prerequisites	CMY 117 GS and CMY 127 GS and MLB 111 GS
Contact time	2 lectures per week, 1 tutorial 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.

Introductory and neurophysiology 211 (FLG 211)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	CMY 127 GS and MLB 111 GS

Contact time 1 practical per week, 2 lectures per week

Language of tuition Module is presented in English

Department Physiology

Period of presentation Semester 1

Module content

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

Practical work: Practical exercises to complement the theory.

Circulatory physiology 212 (FLG 212)

Module credits 12.00

NQF Level 06

Service modules Faculty of Natural and Agricultural Sciences

Prerequisites CMY 127 GS and MLB 111 GS

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Physiology

Period of presentation Semester 1

Module content

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

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

Module credits 12.00

NQF Level 06

Service modules Faculty of Natural and Agricultural Sciences

Prerequisites FLG 211 GS and FLG 212 GS

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Physiology

Period of presentation Semester 2

Module content

Structure, gas exchange and non-respiratory functions of the lungs; structure, excretory and non-urinary functions of the kidneys, acid-base balance, as well as the skin and body temperature control.

Practical work: Practical exercises to complement the theory.

Digestion, endocrinology and reproductive systems 222 (FLG 222)

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

Module content

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

Molecular genetics 251 (GTS 251)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	GTS 161 GS
Contact time	fortnightly tutorials, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 1

Module content

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

Genetic diversity and evolution 261 (GTS 261)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	GTS 251 GS
Contact time	fortnightly tutorials, 2 lectures per week
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.

Elective modules

Lipid and nitrogen metabolism 261 (BCM 261)

Module credits 12.00

NQF Level 06

Service modules Faculty of Health Sciences

Prerequisites BCM 251 GS and BCM 257 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. Online activities include training in scientific reading skills; evaluation of a scientific report; techniques for separation analysis and visualisation of biological molecules; hypothesis design and testing, method design and scientific controls.

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 GS.

Contact time 1 practical per week, 2 lectures per week

Language of tuition Module is presented in English

Department Department of Plant and Soil Sciences

Period of presentation Semester 2

Module content

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

Physical chemistry 282 (CMY 282)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals every other week, 1 tutorial every other week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

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

Analytical chemistry 283 (CMY 283)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 lectures per week, 2 practicals every other week, 1 tutorial every other week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

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

Organic chemistry 284 (CMY 284)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals every other week, 1 tutorial every other week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

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

Inorganic chemistry 285 (CMY 285)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	1 tutorial every other week, 2 practicals every other week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

Atomic structure, structure of solids (ionic model). Coordination chemistry of transition metals: Oxidation states of transition metals, ligands, stereochemistry, crystal field theory, consequences of d-orbital splitting, electrochemical properties of transition metals in aqueous solution. Fundamentals of spectroscopy and introduction to IR spectroscopy. During practical training students learn to acquire and report data ethically. Practical training also deals with the misuse of chemicals and appropriate waste disposal to protect the environment and meet the UN sustainable development goals.

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	Fortnightly practicals/tutorials, 2 lectures per week
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.

Food microbiology 262 (MBY 262)

Module credits	12.00
NQF Level	06
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.

Invertebrate biology 251 (ZEN 251)

Module credits 12.00

NQF Level 06

Service modules Faculty of Education

Prerequisites ZEN 161 GS

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

Language of tuition Module is presented in English

Department Zoology and Entomology

Period of presentation Semester 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 2 lectures per week, 1 practical every 2nd week

Language of tuition Module is presented in English

Department Zoology and Entomology

Period of presentation Semester 2

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 = 72

Elective = 72

Additional information:

Single major track:

- Electives in the third year must be chosen from the listed Biochemistry, Chemistry, Genetics, Microbiology, Plant science, Zoology or a combination of Pharmacology and Biochemistry and/or Genetics modules.
- 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.
- NOTE: Students interested in pursuing postgraduate studies in occupational health and safety must take FLG 322 Industrial Physiology (18 credits). The balance of their elective credits may be chosen from 300-level modules in Biochemistry or Genetics or a combination of Pharmacology (FAR 381 and 382) and Biochemistry and/or Genetics.
- Any other student interested in the field of occupational health and safety may take FLG 322 as an elective.

Dual major track:

- **Human Physiology and Biochemistry combination:** Students must take BCM 356, BCM 357, BCM 367, BCM 368.
- **Human Physiology and Genetics combination:** Students must take GTS 351, GTS 354, GTS 367, GTS 368.
- **Human Physiology and Microbiology combination:** Students must take MBY 351, MBY 355, MBY 364, MBY 365.
- **Human Physiology and Pharmacology combination:** Students must take FAR 381 and 382 combined with 300-level modules in Biochemistry and/or Genetics to a total of 72 credits.
- NOTE: Students interested in pursuing postgraduate studies in occupational health and safety must also take FLG 322 Industrial Physiology (18 credits). In order to obtain the degree with a dual major in any of the above, the stipulated electives must be taken. Any student interested in the field of occupational health and safety may also take FLG 322 as an elective.

Core modules

Higher neurological functions 327 (FLG 327)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 257 GS, FLG 221 GS and FLG 222 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 1

Module content

Overview of higher cognitive functions and the relations between psyche, brain and the immune system. Practical work: Applied practical work with specific examples drawn from South African case studies taught within the framework of the UN Sustainable Development Goal 3 (Good Health and Well-being).

Cellular and developmental physiology 330 (FLG 330)

Module credits 18.00

NQF Level 07

Service modules Faculty of Natural and Agricultural Sciences

Prerequisites BCM 251 GS, BCM 252 GS, BCM 257 GS, FLG 221 GS and FLG 222 GS

Contact time 1 practical per week, 2 lectures per week

Language of tuition Module is presented in English

Department Physiology

Period of presentation Semester 1

Module content

During this module the biology of cellular processes such as the cell cycle, cell death, migration and their related cellular signalling pathways will be discussed as well as their role in early stage embryology and age-related pathologies. Practical work: Exposure to applied molecular biology techniques with specific examples drawn from South African case studies taught within the framework of the UN Sustainable Development Goal of Good Health and Well-being (Sustainable Development Goal 3).

Exercise and nutrition science 331 (FLG 331)

Module credits 18.00

NQF Level 07

Service modules Faculty of Natural and Agricultural Sciences

Prerequisites BCM 251 GS, BCM 252 GS, BCM 257 GS, FLG 221 GS and FLG 222 GS

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Physiology

Period of presentation Semester 2

Module content

Mechanisms of muscle contraction and energy sources. Cardio-respiratory changes, thermo-regulation and other adjustments during exercise. Use and misuse of substances to improve performance. Practical work: Applied practical work with exercise descriptions for the South African context taught within the framework of the UN Sustainable Development Goal 3 (Good Health and Well-being).

Applied and pathophysiology 332 (FLG 332)

Module credits 18.00

NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 257 GS, FLG 221 GS and FLG 222 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Integration of all the human physiological systems. Practical work: Applied practical work.

Elective modules

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

Module credits	18.00
NQF Level	07
Prerequisites	BCM 251 GS and BCM 257 GS and BCM 261 GS and BCM 252 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.

Biocatalysis and integration of metabolism 357 (BCM 357)

Module credits	18.00
NQF Level	07
Prerequisites	BCM 251 GS and BCM 257 GS and BCM 261 GS and BCM 252 GS.
Contact time	2 lectures per week, 1 practical/tutorial 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. Overview of hormone action. Metabolism of xenobiotics. Hormonal regulation of feul metabolism. Metabolic adaptations during diabetes. Obesity and the regulation of body mass. Obesity, metabolic syndrome and Type 2 diabetes (T2D). Management of T2D with diet, exercise and medication. Practical sessions cover tutorials on case studies and biochemical calculations, and hands-on isolation of an enzyme, determination of pH and temperature optima, determination of K_m and V_{max} , enzyme activation and enzyme inhibition.

Cell structure and function 367 (BCM 367)

Module credits 18.00

NQF Level 07

Prerequisites BCM 251 and BCM 257 and BCM 261 GS and BCM 252 GS.

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

Module credits 18.00

NQF Level 07

Prerequisites BCM 251 and BCM 257 and BCM 261 GS BCM 252 GS.

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

Language of tuition Module is presented in English

Department Biochemistry, Genetics and Microbiology

Period of presentation 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)

Module credits 18.00

NQF Level 07

Service modules Faculty of Education

Prerequisites BOT 161

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Department of Plant and Soil Sciences

Period of presentation Semester 1

Module content

Introduction to plant ecophysiology and plants response to environmental stress. Understanding how various biotic and abiotic factors affect plant metabolic processes, including photosynthesis and respiration. Emphasis is placed on the efficiency of the mechanisms whereby C3-, C4 and CAM-plants bind CO₂ and how they are impacted by the environment. To understand the functioning of plants in diverse environments, the relevant structural properties of plants, the impact of soil composition, water flow in the soil-plant air continuum and long distance transport of assimilates will be discussed. Students will research a topic relevant to plant ecophysiology and present this in the form of an oral presentation. Students will conduct a practical project to study the effects of environmental factors on C3 and C4 plant growth and physiology. Students will present the report in a written format according to the guidelines of a relevant scientific journal. Relevant readings will be used to highlight the alignment of the module with the Sustainable Development Goals, with emphasis placed on climate action.

Phytomedicine 365 (BOT 365)

Module credits 18.00

NQF Level 07

Service modules Faculty of Education

Prerequisites BOT 161

Contact time 2 lectures per week, 1 practical per week



Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 2

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.

Physical chemistry 382 (CMY 382)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	2 practicals every other week, 2 lectures per week, 1 discussion classes every other week

Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Theory: Molecular quantum mechanics. Introduction: Shortcomings of classical physics, dynamics of microscopic systems, quantum mechanical principles, translational, vibrational and rotational movement. Atomic structure and spectra: Atomic hydrogen, multiple electron systems, spectra of complex atoms, molecular structure, the hydrogen molecule ion, diatomic and polyatomic molecules, structure and properties of molecules. Molecules in motion: Viscosity, diffusion, mobility. Surface chemistry: Physisorption and chemisorption, adsorption isotherms, surface tension, heterogeneous catalytic rate reactions, capillarity.

Analytical chemistry 383 (CMY 383)

Module credits	18.00
-----------------------	-------

NQF Level	07
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	2 practicals every other week, 1 tutorial every other week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

Separation methods: Extraction, multiple extraction, chromatographic systems. Spectroscopy: Construction of instruments, atomic absorption and atomic emission spectrometry, surface analysis techniques. Mass spectrometry. These techniques are discussed in terms of their use in environmental analysis and the value they contribute to meeting the UN sustainable development goals (#3,6 & 11). Instrumental electrochemistry. The relevance of electrochemistry to providing affordable and clean energy (UN SDG#7) is addressed.

Organic chemistry 384 (CMY 384)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285
Contact time	2 lectures per week, 2 practicals every other week, 1 tutorial every other week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

Theory: NMR spectroscopy: applications. Aromatic chemistry, Synthetic methodology in organic chemistry. Carbon-carbon bond formation: alkylation at nucleophilic carbon sites, aldol and related condensations, Wittig and related reactions, acylation of carbanions (Claisen condensation). Practical: Laboratory sessions are designed to develop the rational thinking behind the design of organic chemistry experiments. An industrial project specifically prepares students for work in SA industry context and honours projects. As part of this practical programme the UN sustainable development goals must be considered in evaluating the best industrial process.

Inorganic chemistry 385 (CMY 385)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Education
Prerequisites	CMY 282, CMY 283, CMY 284 and CMY 285

Contact time	1 tutorial every other week, 2 practicals every other week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 1

Module content

Theory: Structure and bonding in inorganic chemistry. Molecular orbital approach, diatomic and polyatomic molecules, three-centre bonds, metal-metal bonds, transition metal complexes, magnetic properties, electronic spectra, acid-base concepts, non-aqueous solvents, special topics.

Pharmacology 381 (FAR 381)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FLG 211, FLG 212, FLG 221, FLG 222 GS
Contact time	1 lecture per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Pharmacology
Period of presentation	Semester 1

Module content

The undergraduate pharmacology module introduces students to general pharmacological principles, routes of administration, pharmacokinetics and pharmacodynamics. Furthermore, disease treatment with relation to disorders of the cardiovascular, inflammatory and autonomic nervous system is discussed, as well as anaesthesia, asthma, diabetes, diuresis, obesity and pain.

Pharmacology 382 (FAR 382)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	FAR 381, FLG 211, FLG 212, FLG 221, FLG 222 GS
Contact time	1 lecture per week
Language of tuition	Module is presented in English
Department	Pharmacology
Period of presentation	Semester 2

Module content

Hormones, drugs that act on the histaminergic, serotonergic, and dopaminergic receptors. Pharmacotherapy of diabetes mellitus, schizophrenia, depression, obesity, anxiety, insomnia, gastro-intestinal diseases. Anticoagulants, antimicrobial drugs.

Industrial physiology 322 (FLG 322)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	BCM 251 GS, BCM 252 GS, BCM 257 GS, FLG 221 GS and FLG 222 GS
Contact time	1 lecture per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Physiology
Period of presentation	Semester 2

Module content

Problem-orientated module, with the emphasis on occupational health and safety in the industrial environment. Integration of different physiological systems is required. Practical work: Exposure to occupational hygiene measurement techniques. *Students interested in pursuing postgraduate studies in OHS must take FLG 322.

Eukaryotic gene control and development 351 (GTS 351)

Module credits	18.00
NQF Level	07
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

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

Genome evolution and phylogenetics 354 (GTS 354)

Module credits	18.00
NQF Level	07
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

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

Population and evolutionary genetics 367 (GTS 367)

Module credits 18.00

NQF Level 07

Service modules Faculty of Engineering, Built Environment and Information Technology

Prerequisites GTS 251 GS and GTS 261 GS.

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

Language of tuition Module is presented in English

Department Biochemistry, Genetics and Microbiology

Period of presentation Semester 1

Module content

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

Genetics in human health 368 (GTS 368)

Module credits 18.00

NQF Level 07

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

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)

Module credits 18.00

NQF Level 07

Prerequisites MBY 251 GS

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

Module credits 18.00

NQF Level 07

Prerequisites MBY 251 GS, 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

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

Genetic manipulation of microbes 364 (MBY 364)

Module credits 18.00

NQF Level 07

Prerequisites MBY 251 and GTS 251



Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

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

Microbe interactions 365 (MBY 365)

Module credits	18.00
NQF Level	07
Prerequisites	MBY 251 and MBY 355 GS
Contact time	1 practical/tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Biochemistry, Genetics and Microbiology
Period of presentation	Semester 2

Module content

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

Population ecology 351 (ZEN 351)

Module credits	18.00
NQF Level	07
Service modules	Faculty of Education
Prerequisites	No prerequisites.
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Department	Zoology and Entomology
Period of presentation	Semester 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.

Mammalogy 352 (ZEN 352)

Module credits 18.00

NQF Level 07

Service modules Faculty of Education

Prerequisites No prerequisites.

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Zoology and Entomology

Period of presentation Semester 1

Module content

Mammalian origins and their characteristics: evolution of African mammals; structure and function: integument, support and movement; foods and feeding; environmental adaptations; reproduction; behaviour; ecology and biogeography; social behaviour; sexual selection; parental care and mating systems; community ecology; zoogeography. Special topics: parasites and diseases; domestication and domesticated mammals; conservation. The module addresses the sustainable development goals of Life on Land and Good Health and Well-being.

Evolutionary physiology 354 (ZEN 354)

Module credits 18.00

NQF Level 07

Service modules Faculty of Education

Prerequisites No prerequisites.

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Zoology and Entomology

Period of presentation Semester 1

Module content

This module focuses on the integration of physiological systems in the context of animal form and function, and the ways in which evolution shapes the physiological processes that determine the energy, water and nutrient fluxes between animals and their environments. Topics covered include: (i) circulation, gas exchange and excretion; (ii) nutritional ecology; (iii) osmoregulation and thermoregulation; and (iv) reproductive physiology. The major focus of this module is to understand the major sources of physiological diversity, namely scaling, phylogenetic inertia, adaptation and phenotypic plasticity, and applying this knowledge to conceptually link physiological processes at the cellular level to macrophysiological patterns at a global scale. Many examples used in this module are directly relevant to the sustainable development goals of Good Health and Well-being, Sustainable Cities and Communities, Climate Action and Life on Land.

Behavioural ecology 363 (ZEN 363)

Module credits 18.00

NQF Level 07

Service modules Faculty of Education

Prerequisites No prerequisites.

Contact time 2 lectures per week, 1 practical per week

Language of tuition Module is presented in English

Department Zoology and Entomology

Period of presentation Semester 2

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.

General Academic Regulations and Student Rules

The [General Academic Regulations \(G Regulations\)](#) and [General Student Rules](#) apply to all faculties and registered students of the University, as well as all prospective students who have accepted an offer of a place at the University of Pretoria. On registering for a programme, the student bears the responsibility of ensuring that they familiarise themselves with the General Academic Regulations applicable to their registration, as well as the relevant faculty-specific and programme-specific regulations and information as stipulated in the relevant yearbook. Ignorance concerning these regulations will not be accepted as an excuse for any transgression, or basis for an exception to any of the aforementioned regulations. The G Regulations are updated annually and may be amended after the publication of this information.

Regulations, degree requirements and information

The faculty regulations, information on and requirements for the degrees published here are subject to change

and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project

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