



# University of Pretoria Yearbook 2019

## BSc Human Genetics (02133409)

**Minimum duration of study** 3 years

**Total credits** 428

### Admission requirements

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

#### Minimum requirements

##### Achievement level

##### English Home

##### Language or

##### English First

##### Additional

##### Language

		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
5	C	5	C	5	C	<b>30</b>

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

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

#### BSc Extended Programme for the Biological and Agricultural Sciences

##### Minimum requirements

##### Achievement level

##### English Home

##### Language or

##### English First

##### Additional

##### Language

		Mathematics		Physical Science		APS
NSC/IEB	AS Level	NSC/IEB	AS Level	NSC/IEB	AS Level	
4	D	4	D	4	D	<b>24</b>



## Other programme-specific information

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

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

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

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

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

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

The prerequisites are listed in the Alphabetical list of modules.

## Promotion to next study year

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

### **General promotion requirements in the faculty**

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

- A student who is excluded from further studies in terms of the stipulations of the abovementioned regulations,



will be notified in writing by the Dean or Admissions Committee at the end of the relevant semester.

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

## Pass with distinction

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



## Curriculum: Year 1

**Minimum credits: 140**

**Minimum credits:140**

Fundamental = 12

Core = 128

### Additional information:

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

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

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

## Fundamental modules

### Academic information management 102 (AIM 102)

**Module credits** 6.00

#### Service modules

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

**Prerequisites** No prerequisites.

**Contact time** 2 lectures per week

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

**Department** Information Science

**Period of presentation** Semester 2

#### Module content

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

### Academic information management 111 (AIM 111)

**Module credits** 4.00



<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion
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<b>Prerequisites</b>	No prerequisites.
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<b>Contact time</b>	2 lectures per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Information Science
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<b>Period of presentation</b>	Semester 1
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**Module content**  
Find, evaluate, process, manage and present information resources for academic purposes using appropriate technology.

### Academic information management 121 (AIM 121)

<b>Module credits</b>	4.00
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<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
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<b>Prerequisites</b>	No prerequisites.
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<b>Contact time</b>	2 lectures per week
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<b>Language of tuition</b>	Module is presented in English
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<b>Department</b>	Informatics
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<b>Period of presentation</b>	Semester 2
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**Module content**  
Apply effective search strategies in different technological environments. Demonstrate the ethical and fair use of information resources. Integrate 21st-century communications into the management of academic information.

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

<b>Module credits</b>	6.00
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<b>Service modules</b>	Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
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<b>Prerequisites</b>	No prerequisites.
<b>Contact time</b>	2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Unit for Academic Literacy
<b>Period of presentation</b>	Semester 1

### Module content

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

## Academic orientation 102 (UPO 102)

<b>Module credits</b>	0.00
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Natural and Agricultural Sciences Deans Office
<b>Period of presentation</b>	Year

## Core modules

### Biometry 120 (BME 120)

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

### Module content

Simple statistical analysis: Data collection and analysis: Samples, tabulation, graphical representation, describing location, spread and skewness. Introductory probability and distribution theory. Sampling distributions and the central limit theorem. Statistical inference: Basic principles, estimation and testing in the one- and two-sample cases (parametric and non-parametric). Introduction to experimental design. One- and 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.



## Plant biology 161 (BOT 161)

**Module credits** 8.00

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

**Prerequisites** MLB 111 GS

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 2

### Module content

Basic plant structure and function; introductory plant taxonomy and plant systematics; principles of plant molecular biology and biotechnology; adaptation of plants to stress; medicinal compounds from plants; basic principles of plant ecology and their application in natural resource management.

## General chemistry 117 (CMY 117)

**Module credits** 16.00

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

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

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

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

**Department** Chemistry

**Period of presentation** Semester 1

### Module content

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

## General chemistry 127 (CMY 127)

**Module credits** 16.00



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

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

### Module content

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

<b>Service modules</b>	Faculty of Engineering, Built Environment and Information Technology
<b>Prerequisites</b>	MLB 111 GS
<b>Contact time</b>	2 lectures per week, fortnightly tutorials
<b>Language of tuition</b>	Module is presented in English





**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

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

## Molecular and cell biology 111 (MLB 111)

**Module credits** 16.00

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

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

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1

### Module content

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

## Physics for biology students 131 (PHY 131)

**Module credits** 16.00

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

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

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

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

**Department** Physics



**Period of presentation** Semester 1

**Module content**

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

**Mathematics 134 (WTW 134)**

**Module credits** 16.00

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

**Prerequisites** 50% for Mathematics in Grade 12

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

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

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 1

**Module content**

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

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

**Mathematics 165 (WTW 165)**

**Module credits** 16.00

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

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

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

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

**Department** Mathematics and Applied Mathematics

**Period of presentation** Semester 2



## Module content

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

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

## Animal diversity 161 (ZEN 161)

**Module credits** 8.00

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

**Prerequisites** MLB 111 GS or permission from the HOD.

**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, organization and terminology. Evolution of the various animal phyla, morphological characteristics and life cycles of parasitic and non-parasitic animals. Structure and function of reproductive, respiratory, excretory, circulatory and digestive systems.



## Curriculum: Year 2

**Minimum credits: 144**

**Minimum credits: 144**

Core = 144

### Core modules

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

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

#### Module content

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

#### Carbohydrate metabolism 252 (BCM 252)

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



## Module content

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

## Lipid and nitrogen metabolism 261 (BCM 261)

**Module credits** 12.00

**Service modules** Faculty of Health Sciences

**Prerequisites** 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 2

## Module content

Biochemistry of lipids, membrane structure, anabolism and catabolism of lipids. Total ATP yield from the complete catabolism of lipids. Nitrogen metabolism, amino acid biosynthesis and catabolism. Biosynthesis of neurotransmitters, pigments, hormones and nucleotides from amino acids. Catabolism of purines and pyrimidines. Therapeutic agents directed against nucleotide metabolism. Examples of inborn errors of metabolism of nitrogen containing compounds. The urea cycle, nitrogen excretion. Practical training in scientific reading skills: evaluation of a scientific report. Techniques for separation analysis and visualisation of biological molecules. Hypothesis design and testing, method design and scientific controls.

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

**Module credits** 12.00

**Service modules** Faculty of Health Sciences

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

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2



## Module content

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

## Introductory and neurophysiology 211 (FLG 211)

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

### Module content

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

Practical work: Practical exercises to complement the theory.

## Circulatory physiology 212 (FLG 212)

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



## Module content

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

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

**Module credits** 12.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** FLG 211 and FLG 212

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

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

**Department** Physiology

**Period of presentation** Semester 2

## 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

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** FLG 211 and FLG 212

**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

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

**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

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

**Prerequisites** GTS 251 GS

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

**Module content**

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

**Bacteriology 251 (MBY 251)**

**Module credits** 12.00

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

**Prerequisites** MBY 161 GS

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

**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





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

### **Module content**

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.



## Curriculum: Final year

**Minimum credits: 144**

**Minimum credits: 144**

Core = 72

Elective = 72

**Additional information:**

**Single major track:**

- Electives must be chosen from BCM 356, BCM 357, BCM 367, BCM 368, BOT 365, BTC 361, FAR 381, FAR 382, MBY 351, MBY 355, MBY 364, MBY 365.

**Dual major track:**

- **Genetics and Human Physiology combination:** Students must take FLG 327, FLG 330, FLG 331, FLG 332.

## Core modules

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

**Module credits** 18.00

**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

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

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

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 1



## Module content

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

## Population and evolutionary genetics 367 (GTS 367)

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

## Module content

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

## Genetics in human health 368 (GTS 368)

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

## Module content

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

## Elective modules

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

<b>Module credits</b>	18.00
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<b>Prerequisites</b>	BCM 251 or permission from HOD
<b>Contact time</b>	1 practical/tutorial per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Biochemistry, Genetics and Microbiology
<b>Period of presentation</b>	Semester 1

### Module content

Structure, function, bioinformatics and biochemical analyses of nucleotides, oligonucleotides, amino acids, proteins and ligands and their organisation into hierarchical, higher order structures and interdependent systems. Principles of structure-function relationships. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications. Principles of molecular recognition in protein-ligand, protein-protein, protein-DNA, protein-RNA, DNA-DNA, DNA-ligand, DNA-RNA and RNA-RNA interactions. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Population-specific mutations in disease. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance spectroscopy, mass spectrometry and X-ray crystallography. Protein purification and characterization including, pI, molecular mass, amino acid composition and sequence. Mechanistic aspects and regulation of information flow from DNA via RNA to proteins and back. Lectures incorporate the latest insights into the central dogma of biochemistry and viral polymerases which reverse the information flow ensuring students are prepared for a competitive job market. Practical training include hands-on practical sessions for nucleic acid purification, sequencing and structure characterisation, protein production purification (including SDS-PAGE) and sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).

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

<b>Module credits</b>	18.00
<b>Prerequisites</b>	BCM 251 and BCM 252 and BCM 261 or permission from the HOD
<b>Contact time</b>	2 lectures per week, 1 practical/tutorial per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Biochemistry, Genetics and Microbiology
<b>Period of presentation</b>	Semester 1



## Module content

Enzyme nomenclature and classification. Specificity and mechanisms: the active site, mechanisms of catalysis and examples of specific enzyme mechanisms, e.g. lysozyme and carboxypeptidase A. Advanced enzyme kinetics, Cleland nomenclature and multi-substrate reactions. Allosteric enzymes: models by Koshland, Hill and Monod. Ligands binding to proteins. Inhibitors of angiotensin converting enzyme (ACE). RNA as enzymes. Applications of enzymes in food and cosmetics industries and in clinical pathology assays as biomarkers of diseases and toxic responses. Elucidation of metabolic pathways. Antibiotic resistance mechanisms and development of new drugs. Hormonal regulation and integration of mammalian metabolism. Regulation of fuel metabolism after a meal, period between meals and starvation. Metabolic adaptations during diabetes. Obesity and the regulation of body mass. Obesity, metabolic syndrome and Type 2 diabetes (T2D). Management of T2D with diet, exercise and medication. Practical sessions cover tutorials on calculations, isolation of an enzyme, determination of pH and temperature optimum, determination of  $K_m$  and  $V_{max}$ , enzyme activation and enzyme inhibition. Computer simulations of drug design and protein docking to improve efficacy and lower toxicity.

## Cell structure and function 367 (BCM 367)

**Module credits** 18.00

**Prerequisites** BCM 251 and BCM 261 or permission from the HOD

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

Visualising cell structure and localising 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

**Prerequisites** BCM 251 and BCM 252 and BCM 261 or permission from the HOD.

**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.

## Phytomedicine 365 (BOT 365)

**Module credits** 18.00

**Service modules** Faculty of Education

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

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

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

**Department** Department of Plant and Soil Sciences

**Period of presentation** Semester 2

## Module content

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

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

**Module credits** 18.00

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

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

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

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



**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

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

## Pharmacology 381 (FAR 381)

**Module credits** 18.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** FLG 211, FLG 212, FLG 221, FLG 222 GS

**Contact time** 2 lectures per week

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

**Department** Pharmacology

**Period of presentation** Semester 1

### Module content

Introduction, receptors, antagonism, kinetic principles, drugs that impact upon the autonomic and central nervous system, pharmacotherapy of hypertension, angina pectoris, myocardial infarction, heart failure, arrhythmias, and epilepsy. Diuretics, glucocorticosteroids, local anaesthetics, anaesthetic drugs, analgesics, iron and vitamins, oncostatics and immuno suppressants.

## Pharmacology 382 (FAR 382)

**Module credits** 18.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** FAR 381, FLG 211, FLG 212, FLG 221, FLG 222 GS

**Contact time** 2 lectures 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.



## Higher neurological functions 327 (FLG 327)

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physiology
<b>Period of presentation</b>	Semester 1

### Module content

Overview of higher cognitive functions and the relationship between psyche, brain and immune system. Practical work: Applied practical work.

## Cellular and developmental physiology 330 (FLG 330)

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
<b>Contact time</b>	1 practical per week, 2 lectures per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physiology
<b>Period of presentation</b>	Semester 1

### Module content

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.

## Exercise and nutrition science 331 (FLG 331)

<b>Module credits</b>	18.00
<b>Service modules</b>	Faculty of Natural and Agricultural Sciences
<b>Prerequisites</b>	BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222
<b>Contact time</b>	2 lectures per week, 1 practical per week
<b>Language of tuition</b>	Module is presented in English
<b>Department</b>	Physiology
<b>Period of presentation</b>	Semester 2





## Module content

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

## Applied and pathophysiology 332 (FLG 332)

**Module credits** 18.00

**Service modules** Faculty of Natural and Agricultural Sciences

**Prerequisites** BCM 251 GS, BCM 252 GS, BCM 261 GS, BCM 262 GS, FLG 221 and FLG 222

**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

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

## Virology 351 (MBY 351)

**Module credits** 18.00

**Prerequisites** GTS 251 GS and MBY 161 or permission from the HOD.

**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

**Prerequisites** GTS 251 GS, GTS 261 GS, MBY 161, MBY 251 GS and MBY 262 GS or permission from the HOD.

**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

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

**Prerequisites** BCM 251, GTS 251 and MBY 251 or permission from the HOD.

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

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

**Department** Biochemistry, Genetics and Microbiology

**Period of presentation** Semester 2

### Module content

Isolation of clonable DNA (genomic libraries, cDNA synthesis) cloning vectors (plasmids, bacteriophages, cosmids) plasmid incompatibility and control of copy number. Ligation of DNA fragments, modification of DNA end and different ligation strategies. Direct and indirect methods for the identification of recombinant organisms. Characterization (polymerase chain reaction, nucleic acid sequencing) and mutagenesis of cloned DNA fragments. Gene expression in Gram negative (*E.coli*) Gram positive (*B.subtilis*) and yeast cells (*S.cerevisea*). 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

**Prerequisites** GTS 251, MBY 251, MBY 261 GS, MBY 262 GS, and MBY 355 GS or permission from the HOD.

**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.

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.