



University of Pretoria Yearbook 2017

BSc Chemistry (02133173)

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 provisional admission of prospective students. Final admission is based on the Grade 12 results.

Minimum requirements												
Achievement level												
Afrikaans or English				Mathematics				Physical Science				APS
NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	
5	3	C	C	5	3	C	C	5	3	C	C	32

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

Admission requirements for BSc Extended programme for Physical Sciences:

Minimum requirements												
Achievement level												
Afrikaans or English				Mathematics				Physical Science				APS
NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	NSC/IEB	HIGCSE	AS-Level	A-Level	
4	3	D	D	4	3	D	D	4	3	D	D	26

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 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 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 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 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:

Fundamental = 12

Core = 96

Electives = 32

Additional information:

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

Fundamental modules

Academic information management 111 (AIM 111)

Module content:

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

Module credits 4.00

Service modules

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

Prerequisites No prerequisites.

Contact time MAMELODI, 2 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Information Science

Period of presentation Semester 1

Academic information management 121 (AIM 121)

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.

Module credits 4.00



Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week, MAMELODI
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Informatics
Period of presentation	Semester 2

Language and study skills 110 (LST 110)

Module content:

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

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

Academic orientation 102 (UPO 102)

Module credits	0.00
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Natural + Agric Sciences Dean
Period of presentation	Year

Academic information management 102 (AIM 102)

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.

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
Faculty of Veterinary Science

Contact time 2 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Information Science

Period of presentation Semester 2

Core modules

General chemistry 117 (CMY 117)

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.

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 Final Grade 12 marks of at least 60% for Mathematics and 60% for Physical Sciences.

Contact time 1 practical per week, 4 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Chemistry

Period of presentation Semester 1



General chemistry 127 (CMY 127)

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.

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 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 Separate classes for Afrikaans and English

Academic organisation Chemistry

Period of presentation Semester 2

Calculus 114 (WTW 114)

Module content:

*This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218 and WTW 220). Students will not be credited for more than one of the following modules for their degree: WTW 114, WTW 158, WTW 134, WTW 165.

Functions, limits and continuity. Differential calculus of single variable functions, rate of change, graph sketching, applications. The mean value theorem, the rule of L'Hospital. Definite and indefinite integrals, evaluating definite integrals using anti-derivatives, the substitution rule.

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 Humanities

Prerequisites Refer to Regulation 1.2. Mathematics 60% Grade 12.

Contact time 1 tutorial per week, 4 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 1



First course in physics 114 (PHY 114)

Module content:

SI-units. Significant figures. Waves: intensity, superposition, interference, standing waves, resonance, beats, Doppler. Geometrical optics: Reflection, refraction, mirrors, thin lenses, instruments. Physical optics: Young-interference, coherence, diffraction, polarisation. Hydrostatics and dynamics: density, pressure, Archimedes' principle, continuity, Bernoulli. Heat: temperature, specific heat, expansion, heat transfer. Vectors. Kinematics of a point: Relative, projectile, and circular motion. Dynamics: Newton's laws, friction. Work: point masses, gasses (ideal gas law), gravitation, spring, power. Kinetic energy: Conservative forces, gravitation, spring. Conservation of energy. Conservation of momentum. Impulse and collisions. System of particles: Centre of mass, Newton's laws. Rotation: torque, conservation of angular momentum, equilibrium, centre of gravity.

Module credits 16.00

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

Prerequisites Refer to Regulation 1.2: A candidate must have passed Mathematics and Physical Science with at least 60% in the Grade 12 examination

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

Language of tuition Separate classes for Afrikaans and English

Academic organisation Physics

Period of presentation Semester 1

First course in physics 124 (PHY 124)

Module content:

Simple harmonic motion and pendulums. Coulomb's law. Electric field: dipoles, Gauss' law. Electric potential. Capacitance. Electric currents: resistance, resistivity, Ohm's law, energy, power, emf, RC-circuits. Magnetic Field: Hall-effect, Bio-Savart. Faraday's and Lenz's laws. Oscillations: LR-circuits. Alternating current: RLC-circuits, power, transformers. Introductory concepts to modern physics. Nuclear physics: Radioactivity.

Module credits 16.00

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

Prerequisites WTW 114 GS and PHY 114 GS

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

Language of tuition Separate classes for Afrikaans and English

Academic organisation Physics

Period of presentation Semester 2

Mathematics 124 (WTW 124)

Module content:



*Students will not be credited for more than one of the following modules for their degree:

WTW 124, WTW 146, WTW 148 and WTW 164. This module serves as preparation for students majoring in Mathematics (including all students who intend to enrol for WTW 218, WTW 211 and WTW 220).

The vector space R^n , vector algebra with applications to lines and planes, matrix algebra, systems of linear equations, determinants. Complex numbers and factorisation of polynomials. Integration techniques and applications of integration. The formal definition of a limit. The fundamental theorem of Calculus and applications. Vector functions, polar curves and quadratic curves.

Module credits	16.00
Prerequisites	WTW 114
Contact time	4 lectures per week, 1 tutorial per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Mathematics and Applied Maths
Period of presentation	Semester 2

Elective modules

Biometry 120 (BME 120)

Module content:

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

Module credits	16.00
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	1 practical per week, 4 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Statistics
Period of presentation	Semester 2



Plant biology 161 (BOT 161)

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.

Module credits 8.00

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

Prerequisites MLB 111 GS

Contact time fortnightly practicals, 2 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Plant and Soil Sciences

Period of presentation Semester 2

Aspects of human geography 156 (GGY 156)

Module content:

This module begins by fostering an understanding of human geography. Then follows with the political ordering of space; cultural diversity as well as ethnic geography globally and locally; population geography of the world and South Africa: and four economic levels of development. The purpose is to place South Africa in a world setting and to understand the future of the country.

Module credits 8.00

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

Prerequisites No prerequisites.

Contact time 1 tutorial per week, 3 lectures per week

Language of tuition Module is presented in English

Academic organisation Geography, Geoinf + Meteor

Period of presentation Quarter 2

Southern African geomorphology 166 (GGY 166)

Module content:

Investigating southern African landscapes and placing them in a theoretical and global context. The geomorphological evolution of southern Africa. Introduction to the concepts of Geomorphology and its relationships with other physical sciences (e.g. meteorology, climatology, geology, hydrology and biology). The processes and controls of landform and landscape evolution. Tutorial exercises cover basic techniques of



geomorphological analysis, and topical issues in Geomorphology.

Module credits 8.00

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

Prerequisites No prerequisites.

Contact time 4 lectures per week

Language of tuition Module is presented in English

Academic organisation Geography, Geoinf + Meteor

Period of presentation Quarter 3

Introductory genetics 161 (GTS 161)

Module content:

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

Module credits 8.00

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

Prerequisites MLB 111 GS

Contact time fortnightly practicals, 2 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Genetics

Period of presentation Semester 2

Introduction to microbiology 161 (MBY 161)

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.

Module credits 8.00



Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MLB 111 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Microbiology and Plant Path
Period of presentation	Semester 2

Molecular and cell biology 111 (MLB 111)

Module content:

Introductory study of the ultra structure, function and composition of representative cells and cell components. General principles of cell metabolism, molecular genetics, cell growth, cell division and differentiation.

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 Refer to Regulation 1.2: A candidate who has passed Mathematics with at least 50% in the Grade 12 examination

Contact time 4 lectures per week, 1 practical per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Genetics

Period of presentation Semester 1

Climate and weather of Southern Africa 164 (WKD 164)

Module content:

An introduction to the climate and general seasonal climatic circulation patterns of Southern Africa. Basic weather types and weather processes within the Southern African context. Interpretation of synoptic maps and synoptic station reports. Impacts of climate change and extreme climate events on society.

*BSc (Geography) and BSc (Environmental Sciences) students may register for WKD 155. Students are not allowed to earn credits for both WKD 155 and WKD 164.

Module credits 8.00

Service modules Faculty of Education
Faculty of Humanities

Prerequisites No prerequisites.

Contact time 4 lectures per week

Language of tuition Module is presented in English



Academic organisation Geography, Geoinf + Meteor

Period of presentation Quarter 4

Discrete structures 115 (WTW 115)

Module content:

Propositional logic: truth tables, logical equivalence, implication, arguments. Mathematical induction and well-ordering principle. Introduction to set theory. Counting techniques: elementary probability, multiplication and addition rules, permutations and combinations, binomial theorem, inclusion-exclusion rule.

Module credits 8.00

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

Prerequisites Refer to Regulation 1.2: A candidate must have passed Mathematics with at least 50% in the Grade 12 examination

Contact time 2 lectures per week, 1 tutorial per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 1

Dynamical processes 162 (WTW 162)

Module content:

*Students will not be credited for more than one of the following modules for their degree: WTW 162 and WTW 264.

Introduction to the modelling of dynamical processes using elementary differential equations. Solution methods for first order differential equations and analysis of properties of solutions (graphs). Applications to real life situations.

Module credits 8.00

Prerequisites WTW 114 GS

Contact time 2 lectures per week, 1 tutorial per week

Language of tuition Module is presented in English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 2

Animal diversity 161 (ZEN 161)

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.

Module credits	8.00
Service modules	Faculty of Education Faculty of Veterinary Science
Prerequisites	MLB 111 GS or TDH
Contact time	2 lectures per week, fortnightly practicals
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Zoology and Entomology
Period of presentation	Semester 2

Atmospheric structure and processes 155 (WKD 155)

Module content:

*Students are not allowed to earn credits for WKD 155 and WKD 164

Introduction to weather and climate. Climate of South Africa. Urban and rural climate. Meteorological instruments. Motion of the earth. Atmospheric mass and pressure. Energy and heat budget. Moisture in the atmosphere. Cloud development. Climate change. ENSO. Electromagnetic spectrum and remote sensing in meteorology. Synoptic weather systems of South Africa.

Module credits	16.00
Prerequisites	At least 50% for mathematics in grade 12.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Semester 1



Curriculum: Year 2

Minimum credits: 144

Minimum credits:

Core = 48

Elective = 96

Additional information:

Electives in the second year of study can be chosen from modules in the following departments: Geography, Geoinformatics and Meteorology, Geology, Zoology and Entomology, Physics, Plant Science, Computer Science, Mathematics and Applied Mathematics.

Core modules

Physical chemistry 282 (CMY 282)

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.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	4 lectures per week, 1 tutorial per week, 2 practicals per week
Language of tuition	Module is presented in English
Academic organisation	Chemistry
Period of presentation	Quarter 2

Analytical chemistry 283 (CMY 283)

Module content:

Theory: Statistical evaluation of data, gravimetric analysis, aqueous solution chemistry, chemical equilibrium, precipitation-, neutralisation- and complex formation titrations, redox titrations, potentiometric methods, introduction to electrochemistry.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals per week, 4 lectures per week, 1 tutorial per week
Language of tuition	Module is presented in English
Academic organisation	Chemistry
Period of presentation	Quarter 3



Organic chemistry 284 (CMY 284)

Module content:

Theory: 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.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	4 lectures per week, 2 practicals per week, 1 tutorial per week
Language of tuition	Module is presented in English
Academic organisation	Chemistry
Period of presentation	Quarter 1

Inorganic chemistry 285 (CMY 285)

Module content:

Theory: 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, chemistry of the main group elements, electrochemical properties of transition metals in aqueous solution, industrial applications of transition metals. Fundamentals of spectroscopy and introduction to IR spectroscopy.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	2 practicals per week, 1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Chemistry
Period of presentation	Quarter 4

Elective modules

Introduction to proteins and enzymes 251 (BCM 251)

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. Introduction to enzyme kinetics and enzyme inhibition. Allosteric enzymes, regulation of enzyme activity, active centres and mechanisms of enzyme catalysis. Examples of industrial applications of enzymes. Practical training in laboratory techniques and Good Laboratory Practice. Techniques for the quantitative and



qualitative analysis of biological molecules. Processing and presentation of scientific data.

Module credits	12.00
Service modules	Faculty of Health Sciences
Prerequisites	[CMY117 GS] and [CMY127 GS] and [MLB111 GS]
Contact time	2 lectures per week, 90 minute practical per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 1

Carbohydrate metabolism 252 (BCM 252)

Module content:

Biochemistry of carbohydrates. Thermodynamics and bioenergetics. Glycolysis, citric acid cycle and electron transport. Glycogen metabolism, pentose-phosphate pathway, gluconeogenesis and photosynthesis. Practical training in study and analysis of metabolic pathways and enzymes. Scientific method and design: Hypothesis design and testing, method design and scientific controls.

Module credits	12.00
Service modules	Faculty of Education Faculty of Health Sciences
Prerequisites	[CMY117 GS] and [CMY127 GS] and [MLB111 GS]
Contact time	90 minute practical per week, 2 lectures per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 1

Lipid and nitrogen metabolism 261 (BCM 261)

Module content:

Biochemistry of lipids, membrane structure, anabolism and 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 writing skills: evaluation of a scientific report. Techniques for separation and analysis of biological molecules

Module credits	12.00
Service modules	Faculty of Health Sciences
Prerequisites	[CMY117 GS] and [CMY127 GS] and [MLB111 GS]
Contact time	2 lectures per week, 90 minute practical per week



Language of tuition Afrikaans and English is used in one class

Academic organisation Biochemistry

Period of presentation Semester 2

Biochemical principles of nutrition and toxicology 262 (BCM 262)

Module content:

Biochemistry of nutrition and toxicology. Proximate analysis of nutrients. Review of energy requirements and expenditure. 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. Comparison of monogastric and ruminant metabolism. 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. Toxic responses: tissue damage and physiological effects, teratogenesis, immunotoxicity, mutagenesis and carcinogenesis. Examples of toxins: biochemical mechanisms of common toxins and their antidotes. Antibiotics and resistance. Natural toxins from fungi, plants and animals: goitrogens, cyanogens, cholinesterase inhibitors, ergotoxin, aflatoxins Practical training in analyses of nutrients, fatty acids separations, antioxidant determination, and enzyme activity measurements, PO ratio of mitochondria, electrophoresis, extraction, solubility and gel permeation techniques.

Module credits 12.00

Service modules Faculty of Health Sciences

Prerequisites [CMY117 GS] and [CMY127 GS] and [MLB111 GS]

Contact time 2 lectures per week, 90 minute practical per week

Language of tuition Afrikaans and English is used in one class

Academic organisation Biochemistry

Period of presentation Semester 2

South African flora and vegetation 251 (BOT 251)

Module content:

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

Module credits 12.00

Service modules Faculty of Education

Prerequisites BOT 161 or TDH



Contact time	1 practical per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Plant and Soil Sciences
Period of presentation	Semester 1

Plant physiology and biotechnology 261 (BOT 261)

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 drought tolerant and disease resistant plants.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	BOT 161, CMY 117, CMY 127 or TDH
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Plant and Soil Sciences
Period of presentation	Semester 2

Introductory and neurophysiology 211 (FLG 211)

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.

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

Circulatory physiology 212 (FLG 212)

Module content:



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

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

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

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.

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
Academic organisation	Physiology
Period of presentation	Semester 2

Digestion, endocrinology and reproductive systems 222 (FLG 222)

Module content:

Nutrition, digestion and metabolism; hormonal control of the body functions and the reproductive systems.

Practical work: Practical exercises to complement the theory.

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
Academic organisation	Physiology
Period of presentation	Semester 2



Geographic data analysis 220 (GIS 220)

Module content:

The nature of geographical data and measurement. Application of statistics in the geographical domain. Probability, probability distributions and densities, expected values and variances, Central Limit theorem. Sampling techniques. Exploratory data analysis, descriptive statistics, statistical estimation, hypothesis testing, correlation analysis and regression analysis.

Module credits	14.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GMC 100 AND (STK 110 OR BME120)
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Semester 2

Introductory soil science 250 (GKD 250)

Module content:

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

Module credits	12.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CMY 117 GS or TDH
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Plant and Soil Sciences
Period of presentation	Semester 1

Molecular genetics 251 (GTS 251)

Module content:

Chemical nature of DNA. Replication transcription, RNA processing and translation. Control of gene expression in prokaryotes and eukaryotes. Recombinant DNA technology and its applications in gene analysis and manipulation.

Module credits	12.00
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Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	GTS 161 GS
Contact time	fortnightly practicals, 2 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Genetics
Period of presentation	Semester 1

Genetic diversity and evolution 261 (GTS 261)

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.

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 practicals
Language of tuition	Module is presented in English
Academic organisation	Genetics
Period of presentation	Semester 2

Bacteriology 251 (MBY 251)

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.

Module credits 12.00

Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	MBY 161 GS
Contact time	2 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Academic organisation	Microbiology and Plant Path



Period of presentation Semester 1

Mycology 261 (MBY 261)

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.

Module credits 12.00

Service modules Faculty of Engineering, Built Environment and Information Technology

Prerequisites MBY 161

Contact time 1 practical per week, 2 lectures per week

Language of tuition Module is presented in English

Academic organisation Microbiology and Plant Path

Period of presentation Semester 2

Linear algebra 211 (WTW 211)

Module content:

This is an introduction to linear algebra on R^n . Matrices and linear equations, linear combinations and spans, linear independence, subspaces, basis and dimension, eigenvalues, eigenvectors, similarity and diagonalisation of matrices, linear transformations.

Module credits 12.00

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

Prerequisites WTW 124

Contact time 1 tutorial per week, 2 lectures per week

Language of tuition Separate classes for Afrikaans and English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 1

Calculus 218 (WTW 218)

Module content:

Calculus of multivariable functions, directional derivatives. Extrema and Lagrange multipliers. Multiple integrals, polar, cylindrical and spherical coordinates.



Module credits	12.00
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114 and WTW 124
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Mathematics and Applied Maths
Period of presentation	Semester 1

Analysis 220 (WTW 220)

Module content:

Properties of real numbers. Analysis of sequences and series of real numbers. Power series and theorems of convergence. The Bolzano-Weierstrass theorem. The intermediate value theorem and analysis of real-valued functions on an interval. The Riemann integral: Existence and properties of the interval.

Module credits	12.00
Service modules	Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114 and WTW 124
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Mathematics and Applied Maths
Period of presentation	Semester 2

Linear algebra 221 (WTW 221)

Module content:

Abstract vector spaces, change of basis, matrix representation of linear transformations, orthogonality, diagonalisability of symmetric matrices, some applications.

Module credits	12.00
Service modules	Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 211
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Separate classes for Afrikaans and English
Academic organisation	Mathematics and Applied Maths



Period of presentation Semester 2

Discrete structures 285 (WTW 285)

Module content:

Setting up and solving recurrence relations. Equivalence and partial order relations. Graphs: paths, cycles, trees, isomorphism. Graph algorithms: Kruskal, Prim, Fleury. Finite state automata.

Module credits 12.00

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

Prerequisites WTW 115

Contact time 1 tutorial per week, 2 lectures per week

Language of tuition Module is presented in English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 2

Differential equations 286 (WTW 286)

Module content:

*Students will not be credited for more than one of the modules for their degree: WTW 264, WTW 286
Theory and solution methods for ordinary differential equations and initial value problems: separable and linear first-order equations, linear equations of higher order, systems of linear equations. Application to mathematical models. Numerical methods applied to nonlinear systems. Qualitative analysis of linear systems.

Module credits 12.00

Service modules Faculty of Economic and Management Sciences

Prerequisites WTW 114, WTW 124 and WTW 162

Contact time 1 tutorial per week, 2 lectures per week

Language of tuition Module is presented in English

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 1

City structure, environment and society 266 (GGY 266)

Module content:

An urbanising world. Urban structure and land use. Urban processes. The urban environment. Social structure and change in cities. Living in the city. Economy, society and politics in the city. Third-world cities and South African cities. Urban futures.

Module credits 24.00



Service modules Faculty of Education
Faculty of Humanities

Prerequisites No prerequisites.

Contact time 1 practical per week, 3 lectures per week

Language of tuition Module is presented in English

Academic organisation Geography, Geoinf + Meteor

Period of presentation Semester 2

Vector analysis 248 (WTW 248)

Module content:

Vectors and geometry. Calculus of vector functions with applications to differential geometry, kinematics and dynamics. Vector analysis, including vector fields, line integrals of scalar and vector fields, conservative vector fields, surfaces and surface integrals, the Theorems of Green, Gauss and Stokes with applications.

Module credits 12.00

Service modules Faculty of Education

Prerequisites WTW 218

Contact time 1 discussion class per week, 2 lectures per week

Language of tuition Afrikaans and English is used in one class

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 2



Curriculum: Final year

Minimum credits: 144

Minimum credits:

Core = 72

Elective = 72

Core modules

Physical chemistry 382 (CMY 382)

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.

Module credits 18.00

Service modules Faculty of Education

Prerequisites CMY 282, CMY 283, CMY 284 and CMY 285

Contact time 2 practicals per week, 4 lectures per week, 1 discussion class per week

Language of tuition Module is presented in English

Academic organisation Chemistry

Period of presentation Quarter 4

Analytical chemistry 383 (CMY 383)

Module content:

Theory: Separation methods: Extraction, multiple extraction, chromatographic systems. Spectroscopy: Construction of instruments, atomic absorption and atomic emission spectrometry, surface analysis techniques. Mass spectrometry. Instrumental electrochemistry.

Module credits 18.00

Service modules Faculty of Education

Prerequisites CMY 282, CMY 283, CMY 284 and CMY 285

Contact time 1 discussion class per week, 2 practicals per week, 4 lectures per week

Language of tuition Module is presented in English

Academic organisation Chemistry



Period of presentation Quarter 1

Organic chemistry 384 (CMY 384)

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).

Module credits 18.00

Service modules Faculty of Education

Prerequisites CMY 282, CMY 283, CMY 284 and CMY 285

Contact time 2 practicals per week, 1 discussion class per week, 4 lectures per week

Language of tuition Module is presented in English

Academic organisation Chemistry

Period of presentation Quarter 3

Inorganic chemistry 385 (CMY 385)

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, reactivity and reaction mechanisms, reaction types, acid-base concepts, non-aqueous solvents, special topics.

Module credits 18.00

Service modules Faculty of Education

Prerequisites CMY 282, CMY 283, CMY 284 and CMY 285

Contact time 2 practicals per week, 4 lectures per week, 1 discussion class per week

Language of tuition Module is presented in English

Academic organisation Chemistry

Period of presentation Quarter 2

Elective modules

Applied geomorphology 363 (GGY 363)

Module content:

*Note: The content of this module is the same as GGY 361 and students are not allowed to earn credits for both GGY 361 and GGY 363.

Interactions of geomorphic processes within the physical and built environments; themes such as geomorphology



and environmental change, slope processes and the environment, geomorphic risks and hazards, soil erosion and conservation, geomorphology in environmental management, applied weathering.

Module credits	12.00
Service modules	Faculty of Education
Prerequisites	GGY 252
Contact time	4 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Quarter 4

Geographic information systems 310 (GIS 310)

Module content:

Advanced theory and practice of Geographic Information Systems; GIS applications; design and implementation of GIS applications.

Module credits	24.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GGY 283 or GIS 221
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Semester 1

Spatial analysis 320 (GIS 320)

Module content:

Construction of Raster Geovisualisations, spatial model construction and use, multi-criteria decision analysis. Factor analysis: Principle component analysis. Geostatistics: Spatial dependence modelling, ordinary kriging. Markov chains and cellular Automata, combined models. A project or assignments of at least 64 notional hours.

Module credits	22.00
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GIS 220 and GGY 283
Contact time	3 lectures per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Semester 2



Numerical analysis 383 (WTW 383)

Module content:

Direct methods for the numerical solution of systems of linear equations, pivoting strategies. Iterative methods for solving systems of linear equations and eigenvalue problems. Iterative methods for solving systems of nonlinear equations. Introduction to optimization. Algorithms for the considered numerical methods are derived and implemented in computer programmes. Complexity of computation is investigated. Error estimates and convergence results are proved.

Module credits 18.00

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

Prerequisites WTW 114, WTW 124 and WTW 211

Contact time 2 lectures per week, 1 practical per week

Language of tuition Afrikaans and English is used in one class

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 2

Geometry 389 (WTW 389)

Module content:

Axiomatic development of neutral, Euclidean and hyperbolic geometry. Using models of geometries to show that the parallel postulate is independent of the other postulates of Euclid.

Module credits 18.00

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

Prerequisites WTW 211

Contact time 2 lectures per week, 1 tutorial per week

Language of tuition Afrikaans and English is used in one class

Academic organisation Mathematics and Applied Maths

Period of presentation Semester 2

Sustainable development 356 (GGY 356)

Module content:

The module conceptually integrates environmental, economic, and social components of sustainable development. Other topics covered include changing perceptions on development and environment, development paradigms, challenges of sustainable development, actors and actions in sustainable development, rural and urban livelihoods, and a Third World assessment of sustainable development in the developing world.



Module credits	18.00
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Quarter 1

Development frameworks 366 (GGY 366)

Module content:

Classic development frameworks. Spatial development history and legacy in South Africa. Overview of contemporary environmental legislation in South Africa. Rural development strategy. Rural and agricultural reconstruction. Land reform. Urban development and strategy. Urban spatial reconstruction. National spatial development frameworks.

Module credits	18.00
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	No prerequisites.
Contact time	3 lectures per week, 1 practical per week
Language of tuition	Module is presented in English
Academic organisation	Geography, Geoinf + Meteor
Period of presentation	Quarter 3

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

Module content:

Perspectives on the flow of information from nucleic acids to proteins, the structure and functions of nucleic acids and proteins and their organisation into hierarchical, interdependent systems. Nucleic acid structure as observed in fibres and crystals as well as global DNA and RNA analyses (methods and bioinformatic analyses). Biochemical analyses of nucleotides. DNA-DNA recognition: non-standard and higher order DNA structures. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Principles of small molecule-DNA recognition. Principles of protein-DNA recognition and interactions. Bioinformatics predictions of protein and small molecule DNA interactions. Chemical reactivity of amino acids. Domain structures of proteins and Ramachandran plots. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications, conjugated proteins and bioinformatics predictions. Principles of protein function and protein structure relationships. Protein-ligand and protein-protein interactions. Protein aggregation in disease. Examples of the diverse functions of proteins and peptides, including enzymes, hormones, neurotransmitters, antibodies, receptors, transport and membrane



proteins. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance, mass spectrometry and X-ray crystallography. Protein purification and characterization including, pI, molecular mass, amino acid composition and sequence. Practical training will include interactive computer-guided demonstrations of protein analysis, hands-on practical sessions for nucleic acid purification and chemical structure characterisation, protein expression and purification (including SDS-PAGE), protein sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).

Module credits	18.00
Prerequisites	BCM 251 and BCM 252
Contact time	180 minute practical per week, 2 lectures per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 1

Biocatalysis and integration of metabolism 357 (BCM 357)

Module content:

Nomenclature: 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. Problems and answers: tutorials of problems and answers based on above concepts. Integration of metabolism; hormones and second messengers; cell signalling; a case study in connectivity among metabolic pathways and their regulation, in for example diabetes and starvation. 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.

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, enzyme inhibition, purification table and final report, oral defense of report.

Module credits	18.00
Prerequisites	BCM 251 and BCM 252 and BCM 261
Contact time	2 lectures per week, 180 minute practical per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 1

Cell structure and function 367 (BCM 367)

Module content:

Visualising cell structure and localising proteins within cells. Cell ultrastructure. Purification of subcellular organelles. Culturing of cells. Diversity and commonality of cells. Biomembrane structure. Transmembrane



transport of ions and small molecules. Moving proteins into membranes and organelles. Vesicular traffic, secretion, exocytosis and endocytosis. Cell organisation and movement. Cell-cell and cell-matrix adhesion. Practical training includes tutorials on cytometry and microscopy, mini-research projects where students are introduced and guided through aspects of research methodology, experimental planning as well as techniques associated with cellular assays. Active transport studies in yeast cells.

Module credits	18.00
Prerequisites	BCM 251 and BCM 252 and BCM 261
Contact time	2 lectures per week, 180 minute practical per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 2

Molecular basis of disease 368 (BCM 368)

Module content:

Normal and abnormal regulation of the cell cycle: The biochemistry of proliferation, quiescence, senescence, differentiation and apoptosis, illustrated by cancer. Host-Pathogen co-evolution: How adaptive immunity emerged from innate immunity. Infection: Molecular and cellular immunobiochemistry of protection against viral, bacterial and parasitic pathogens. Auto-immunity: Molecular mechanisms of the maintenance and failure of the recognition of foreign in the context of self in the mammalian body. Practical training includes debate on ethics of research on animal and human diseases, experimental design and execution of an immunoassay to test for a biomarker antibody of an infectious disease, tutorials to determine the performance of a diagnostic test for disease, including the principle of ROC curve analysis, positive and negative predictiveness, sensitivity, specificity and accuracy, applications of polyclonal and monoclonal antibodies for characterisation of disease with fluorescence, confocal and electron microscopy, flow cytometry and biosensors.

Module credits	18.00
Prerequisites	BCM 251 and BCM 252 and BCM 261
Contact time	180 minute practical per week, 2 lectures per week
Language of tuition	Afrikaans and English is used in one class
Academic organisation	Biochemistry
Period of presentation	Semester 2

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 each student to familiarise himself or herself 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.