BSc *Environmental and Engineering Geology* (02133043)

Department	Geology
Minimum duration of study	3 years
Total credits	420
NQF level	07

Admission requirements

Important information for all prospective students for 2025

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

Minimum requirements Achievement level English Home Language or English First Additional Language	Mathematics	Physical Sciences	APS
NSC/IEB	NSC/IEB	NSC/IEB	
5	5	5	**34**

Life Orientation is excluded when calculating the APS.

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

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

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

Successful candidates will be notified once admitted or conditionally admitted.

Unsuccessful candidates will be notified after 30 June.

Applicants should check their application status regularly on the UP Student Portal at click here.

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

International students: Click here.

Transferring students

A transferring student is a student who, at the time of applying at the University of Pretoria (UP) is/was a

registered student at another tertiary institution. A transferring student will be considered for admission based on NSC or equivalent qualification and previous academic performance. Students who have been dismissed from other institutions due to poor academic performance will not be considered for admission to UP.

Closing dates: Same as above.

Returning students

A returning student is a student who, at the time of application for a degree programme is/was a registered student at UP, and wants to transfer to another degree at UP. A returning student will be considered for admission based on NSC or equivalent qualification and previous academic performance.

Note:

- Students who have been excluded/dismissed from a faculty due to poor academic performance may be considered for admission to another programme at UP, as per faculty-specific requirements.
- Only ONE transfer between UP faculties and TWO transfers within a faculty will be allowed.
- Admission of returning students will always depend on the faculty concerned and the availability of space in the programmes for which they apply.

Closing date for applications from returning students

Unless capacity allows for an extension of the closing date, applications from returning students must be submitted before the end of August via your UP Student Centre.

Other programme-specific information

1.1 Requirements for specific modules

A candidate who:

a. does not qualify for STK 110, must enrol for STK 113 and STK 123;
b. registers for Mathematical Statistics (WST) and Statistics (STK) modules must take note that WST and STK modules, except for STK 281, may not be taken simultaneously in a programme; a student must take one and only one of the following options:

- WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, WST 321, and STK 353

    or

- WST 111, WST 121, WST 212, WST 211, WST 221, WST 311, WST 312, WST 322, STK 320, STK 353.

    or

- STK 110, STC 122, STK 210, STK 220, WST 212, STK 310, STK 320, STK 353.

c. registers for a module presented by another faculty must take note of the timetable clashes, prerequisites for that module, subminimum required in examination papers, supplementary examinations, etc.

1.2 Fundamental modules

a. It is compulsory for all new first-year students to satisfactorily complete the Academic orientation (UPO 102) and to take Academic information management modules (AIM 111 and AIM 121) and Language and study skills (LST 110). Please see curricula for details.
b. Students who intend to apply for admission to MBChB or BChD in the second semester, when places become available in those programmes, may be permitted to register for up to 80 module credits and 4 core modules

in the first semester during the first year provided that they obtained a final mark of no less than 70% for Grade 12 Mathematics and achieved an APS of 34 or more in the NSC.

Promotion to next study year

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

General promotion requirements in the faculty
All students whose academic progress is not acceptable can be suspended from further studies.

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

Curriculum: Year 1

Minimum credits: 126

Fundamental =   14
Core   =   128

Fundamental modules

Academic information management 111 (AIM 111)

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

Module content

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

Academic information management 121 (AIM 121)

Module credits	4.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities Faculty of Law Faculty of Health Sciences Faculty of Natural and Agricultural Sciences Faculty of Theology and Religion Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week

Language of tuition	Module is presented in English
Department	Informatics
Period of presentation	Semester 2

Module content

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

Language and study skills 110 (LST 110)

Module credits	6.00
NQF Level	05
Service modules	Faculty of Natural and Agricultural Sciences Faculty of Veterinary Science
Prerequisites	No prerequisites.
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Unit for Academic Literacy
Period of presentation	Semester 1

Module content

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

Academic orientation 102 (UPO 102)

Module credits	0.00
NQF Level	00
Language of tuition	Module is presented in English
Department	Natural and Agricultural Sciences Dean's Office
Period of presentation	Year

Core modules

General chemistry 117 (CMY 117)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science

Prerequisites	A candidate must have Mathematics for at least 60% and 60% for Physical Sciences.
Contact time	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 VSEPR-model. Nomenclature of inorganic ions and compounds. Classification of reactions: precipitation, acid-base, redox reactions and gas-forming reactions. Mole concept and stoichiometric calculations concerning chemical formulas and chemical reactions. Principles of reactivity: energy and chemical reactions. Physical behaviour gases, liquids, solids and solutions and the role of intermolecular forces. Rate of reactions: Introduction to chemical kinetics.

General chemistry 127 (CMY 127)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Health Sciences Faculty of Veterinary Science
Prerequisites	Natural and Agricultural Sciences students: CMY 117 GS or CMY 154 GS Health Sciences students: none
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

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

Introduction to geology 155 (GLY 155)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology

Prerequisites	A candidate must have passed Mathematics with at least 60% in the Grade 12 examination.
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

Solar system; structure of solid matter; minerals and rocks; introduction to symmetry and crystallography; important minerals and solid solutions; rock cycle; classification of rocks. External geological processes (gravity, water, wind, sea, ice) and their products (including geomorphology). Internal structure of the earth. The dynamic earth – volcanism, earthquakes, mountain building – the theory of plate tectonics. Geological processes (magmatism, metamorphism, sedimentology, structural geology) in a plate tectonic context. Geological maps and mineral and rock specimens. Interaction between man and the environment, and nature of anthropogenic climate change.

Earth history 163 (GLY 163)

Module credits	16.00
NQF Level	05
Prerequisites	GLY 155
Contact time	1 practical per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

This module will give an overview of earth history, from the Archaean to the present. Important concepts such as the principles of stratigraphy and stratigraphic nomenclature, geological dating and international and South African time scales will be introduced. A brief introduction to the principles of palaeontology will be given, along with short descriptions of major fossil groups, fossil forms, ecology and geological meaning. In the South African context, the major stratigraphic units, intrusions and tectonic/metamorphic events will be detailed, along with related rock types, fossil contents, genesis and economic commodities. Anthropogenic effects on the environment and their mitigation. Practical work will focus on the interpretation of geological maps and profiles.

First course in physics 114 (PHY 114)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	A candidate must have passed Mathematics and Physical Science 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

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.

Statics 122 (SWK 122)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	WTW 158, admission to relevant programme
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Semester 2

Module content

Equivalent force systems, resultants. Newton's laws, units. Forces acting on particles. Rigid bodies: principle of transmissibility, resultant of parallel forces. Vector moments and scalar moments. Relationship between scalar- and vector moments. Couples. Equivalent force systems on rigid bodies. Resultants of forces on rigid bodies. Equilibrium in two and three dimensions. Hooke's law. Trusses and frameworks. Centroids and second moments of area. Beams: distributed forces, shear force, bending moment, method of sections, relationship between load, shear force and bending moment.

Calculus 114 (WTW 114)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences Faculty of Humanities
Prerequisites	60% for Mathematics in Grade 12

Contact time	1 tutorial per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

*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.

Mathematics 124 (WTW 124)

Module credits	16.00
NQF Level	05
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 114
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 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 Rn, 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 and quadratic curves.

Curriculum: Year 2

Minimum credits: 142

Core   =   94
Elective   =   48

Additional information:

Students who do not intend to continue with Mathematics on third year level may replace WTW 220 with WTW 224

A block of 48 elective credits must be selected from the following-

- **Chemistry:** CMY 282, CMY 283, CMY 284, CMY 285 (48 credits)
- **Mathematics:** WTW 211, WTW 218, WTW 220, WTW 221 (48 credits)
- **Applied Mathematics:** WTW 211, WTW 218, WTW 248, WTW 264 (48 credits)
- **GIS/Geomorphology:** GGY 252, GIS 220, GGY 201 (36 credits)

Core modules

Geographic information systems introduction 221 (GIS 221)

Module credits	12.00
NQF Level	06
Prerequisites	Prohibited combination GGY 283. Max 350 students.
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

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

Introductory soil science 250 (GKD 250)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	CMY 117 GS
Contact time	1 practical per week, 3 lectures per week
Language of tuition	Module is presented in English

Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Soil is a finite resource and with the global challenges we are facing, it is more important than ever to understand and sustainably manage soil. Our daily lives are impacted by soil in several ways, including the food we eat, the water we drink, and the environment we live in. In this Introductory Soils module, we will look at how basic and more advanced abiotic and biotic soil properties impact us and the larger environment. We will also examine the fundamental principles behind sustainable soil use management.

Sedimentology 253 (GLY 253)

Module credits	24.00
NQF Level	06
Prerequisites	CMY 117, CMY 127, GLY 155, GLY 163, and one of WTW 134, WTW 114 or BME 120.
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

This module introduces the basic principles and concepts of sedimentology. Building on existing knowledge on stratigraphy and mineralogy from the first year, sediments will be followed from their origin (precursor rocks that experienced weathering and erosion) through diverse modes of transport to their final place of deposition on land and in the sea. The formation of sedimentary textures and structures and their interpretation in terms of sedimentary environments, as well as post-depositional diagenetic processes, will be discussed. Furthermore, some economic aspects of sedimentology will be covered, such as placer deposits and conventional and renewable energy sources. Later parts in the course will concentrate on basin-forming processes and provide an overview of modern basin analysis. An introduction to sequence stratigraphy and sedimentary geochemistry will be offered as part of this, both of which are important applications of sedimentology for interpreting sea level variations and climatic changes.

Practical sessions: During the hands-on practicals, participants will learn how to classify rocks using a wide spectrum of different techniques while developing an appreciation of the processes that result in the formation of sediments, sedimentary rocks, and entire sedimentary sequences.
This will include presenting the fundamentals of optical mineralogy and how to examine some of the major minerals that comprise sedimentary rocks in thin sections using transmitted light microscopy. Further aspects of the practical sessions will focus on grain size/sieve analysis and basic statistical analysis. Sedimentary geochemistry will be used to identify the degrees of alteration and help interpret climatic and environmental conditions during the time of sediment emplacement. Furthermore, field data acquisition from sedimentary rocks, interpretation of sedimentary profiles and core logs, and writing of reports and oral presentations will be practiced.

Igneous and metamorphic petrology 263 (GLY 263)

Module credits	24.00
NQF Level	06
Prerequisites	GLY 255
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

Classification and nomenclature of igneous rocks. The nature of silicate melts; physical and chemical factors influencing crystallisation and textures of igneous rocks. Phase diagrams, fractional crystallisation and partial melting. Trace elements and isotopes, and their use in petrogenetic studies. Global distribution of magmatism and its origin. Mid-oceanic ridges, active continental margins, intraplate magmatism. Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments.

Geological field mapping 266 (GLY 266)

Module credits	6.00
NQF Level	06
Prerequisites	GLY 253
Contact time	7 days full-time block week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Introduction to field mapping techniques.

Strength of materials 210 (SWK 210)

Module credits	16.00
NQF Level	06
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	Faculty of EBIT: SWK 122 and WTW 164 OR SWK 122, WTW 161 and WTW 168. Faculty of Natural and Agricultural Sciences: SWK 122 and WTW 124 OR SWK 122, WTW 126 and WTW 128. Admission to relevant programme.
Contact time	2 tutorials per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering

Period of presentation	Semester 1

Module content

Concept of Stress: Stresses in structural members, stress on oblique plane and stress under general loading, components of stress, design considerations. Stress and Strain: statically indeterminate problems, thermal effects, Poisson's ratio, generalised Hookes Law, shearing strain, stress-strain relationships. Torsion: Torsion of circular bars, stresses and strains in pure shear, power transmission, and statically indeterminate torsional members. Pure Bending: symmetric members in pure bending, stresses and deformations, deformations in transverse cross-sections, members made of composite materials, eccentric axial loading. Analysis and Design of Beams for Bending: shear and bending moment diagrams, relationships between load, shear and bending moments, design of prismatic beams for bending. Shearing stresses in Beams and Thin-Walled Members: Horizontal shearing stresses in beams, shearing stresses in Thin-Walled members. Transformation of Stress and Strain: Plane stress transformation, Mohr's circle, principal stresses, maximum values and stress variation in prismatic beams; Plane strain transformation, Mohr's circle, principal strains, maximum values, general state of stress, stresses in Thin-Walled pressure vessels. Principal Stresses under a given Loading: Principal stresses in beams, design of transmission shafts, stresses under combined loads. Deflection of Beams: Deformation under transverse loading, statically indeterminate beams, method of superposition. Energy Methods: Strain energy, elastic strain energy, strain energy for a general state of stress.

Elective modules

Physical chemistry 282 (CMY 282)

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

Module content

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

Analytical chemistry 283 (CMY 283)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education
Prerequisites	CMY 117 and CMY 127
Contact time	1 tutorial every other week, 2 lectures per week, 2 practicals every other week

Language of tuition	Module is presented in English
Department	Chemistry
Period of presentation	Semester 2

Module content

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

Organic chemistry 284 (CMY 284)

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

Module content

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

Inorganic chemistry 285 (CMY 285)

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

Module content

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

City, structure, environment and society 201 (GGY 201)

Module credits	14.00
NQF Level	06
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	GGY 156
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

The module introduces students to urban settlement patterns, processes and structures. Using a series of case studies, it aims to develop an understanding of the challenges facing urban areas both in South Africa and globally.

Process geomorphology 252 (GGY 252)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Education Faculty of Humanities
Prerequisites	GGY 166 or GLY 155
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 1

Module content

Physical processes that influence the earth's surface and management. Specific processes and their interaction in themes such as weathering; soil erosion; slope, mass movement and periglacial processes. Practical laboratory exercises and assignments are based on the themes covered in the module theory component.

Geographic data analysis 220 (GIS 220)

Module credits	14.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology
Prerequisites	GMC 110 and (STK 110 OR BME 120)
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Geography Geoinformatics and Meteorology
Period of presentation	Semester 2

Module content

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. Examples used throughout the course are drawn from South African and African case studies and taught within the framework of the UN Sustainable Development Goals.

Linear algebra 211 (WTW 211)

Module credits	12.00
NQF Level	06
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	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

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

Calculus 218 (WTW 218)

Module credits	12.00
NQF Level	06

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	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 1

Module content

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

Analysis 220 (WTW 220)

Module credits	12.00
NQF Level	06
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, WTW 211 and WTW 218
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*This module is recommended as an elective only for students who intend to enrol for WTW 310 and/or WTW 320. Students will not be credited for more than one of the following modules for their degree: WTW 220 and WTW 224.

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.

Linear algebra 221 (WTW 221)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education Faculty of Economic and Management Sciences
Prerequisites	WTW 211 and WTW 218

Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

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

Techniques of analysis 224 (WTW 224)

Module credits	12.00
NQF Level	06
Prerequisites	WTW 124 and WTW 211 GS and WTW 218 GS
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

Module content

*This module does not lead to admission to WTW 310 or WTW 320. Students will not be credited for more than one of the following modules for their degree: WTW 220 and WTW 224.
Sequences of real numbers: convergence and monotone sequences. Series of real numbers: convergence, integral test, comparison tests, alternating series, absolute convergence, ratio and root tests. Power series: representation of functions as power series, Taylor and Maclaurin series. Application to series solutions of differential equations.

Vector analysis 248 (WTW 248)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Education
Prerequisites	WTW 218
Contact time	1 tutorial per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Mathematics and Applied Mathematics
Period of presentation	Semester 2

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.

Differential equations 264 (WTW 264)

Module credits	12.00
NQF Level	06
Service modules	Faculty of Engineering, Built Environment and Information Technology Faculty of Economic and Management Sciences
Prerequisites	WTW 114, WTW 124, and WTW 211
Contact time	1 tutorial per week, 2 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 both WTW 162 and WTW 264 or both WTW 264 and WTW 286 for their degree.

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. Laplace transform.

Curriculum: Final year

Minimum credits: 138

Core   =   122
Elective   =   16

Additional information:
Either GLY 367 (24 credits) or SGM 323 (16 credits) must be taken in the second semester.

Core modules

Soil chemistry 320 (GKD 320)

Module credits	14.00
NQF Level	07
Prerequisites	GKD 250
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

Soil chemistry is the study of the chemical behaviour (precipitation, dissolution, sorption, oxidation, reduction, volatilization etc.) of elements and compounds in the soil. Soil exerts a control on nutrient availability and therefore on nutrient cycling (for example the soil-plant system). The growing anthropogenic pressure on soil and the larger environment means a fundamental understanding of the behaviour of pollutants is an increasingly important skill set required by industry. In this module we will look at the soil solution chemistry, mineral solubility, redox chemistry, as well as the chemistry at the surface of soil minerals, of a wide range of nutrients and pollutants. Soil acidification, weathering and associated chemicalmineralogical transformation, as well as landscape dynamics of carbon, iron and manganese receive special attention in this module.

Soil formation and classification 350 (GKD 350)

Module credits	14.00
NQF Level	07
Prerequisites	GKD 250 GS
Contact time	1 practical per week, 2 lectures per week
Language of tuition	Module is presented in English
Department	Department of Plant and Soil Sciences
Period of presentation	Semester 1

Module content

Basic concepts of soil classification, soil pedology and pedochemistry. Underlying principles of global soil classification systems. A taxonomic system for South African soils. Identification of soil horizons, forms and families. An introduction to the World Reference Base for Soil Resources. Practical work: Field, laboratory and class practicals.

Advanced Geological field mapping 368 (GLY 368)

Module credits	6.00
NQF Level	07
Prerequisites	GLY 263
Contact time	7 days full-time block week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Year

Module content

Advanced field mapping techniques.

Engineering geology and rock mechanics 369 (GLY 369)

Module credits	36.00
NQF Level	07
Prerequisites	GLY 365
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

Definition and scope of engineering geology; engineering geological properties and problems of rocks and soils within different stratigraphic units and climatic regions in southern Africa. Strength and failure modes of rock material and rock failure criteria. The characteristics of joints in rock. Joint line surveys and interpretation of data. Characteristics of a rock mass, rock mass classification and determination of strength. Slope stability in surface mines. Induced seismicity due to deep mining and rock bursts. This is in support of United Nationals Sustainable Development Goals dealing with clean water, sanitation, infrastructure development.

Structural geology and hydrogeology 370 (GLY 370)

Module credits	36.00
NQF Level	07
Prerequisites	GLY 263

Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 1

Module content

This is an integrated theoretical and practical module dealing with the principles and analysis of deformed rocks, as well as the movement of fluids like water and air through these rocks and other media such as soils and karst. Faults, folds and shear zones form and behave differently in terms of seismology and hydraulic behaviour in the vadose (unsaturated) and phreatic (saturated) zones. Underground water feeds rivers and biota for survival. It is, however, also susceptible to contamination and pollution causing changes in its quality due to many natural and anthropogenic activities. In countries like South Africa, where fractured aquifers dominate, structural geology is the first step in understanding this significant source of water.

Soil mechanics 311 (SGM 311)

Module credits	16.00
NQF Level	07
Service modules	Faculty of Natural and Agricultural Sciences
Prerequisites	(SWK 210), admission to relevant programme
Contact time	1 practical per week, 2 tutorials per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Semester 1

Module content

Introduction to soil mechanics. Introduction to clay mineralogy. Mass, volume relationships and phases of soil. Groundwater flow and permeability. Effective stress principles. Suction pressures in saturated as well as partially saturated soil. The Mohr circle and stresses at a point. The Mohr-Coulomb strength theory and the stress-strain properties of soil. The Boussinesq theory. Consolidation theory and soil settlement.

Elective modules

Economic geology 367 (GLY 367)

Module credits	36.00
NQF Level	07
Prerequisites	GLY 365
Contact time	2 practicals per week, 4 lectures per week
Language of tuition	Module is presented in English
Department	Geology
Period of presentation	Semester 2

Module content

This module details the genesis and exploitation of major ore deposits, with an emphasis on South African examples. The processes through which ore deposits are formed and modified will be discussed, highlighting the relevance of sedimentary, metamorphic and igneous processes in the genesis of world-class ore bodies. The module will also address the methods of mining commonly used, and the international commodity market, including a brief introduction to ore reserve estimation and the evaluation of potential ore deposits. The section of the module involving mineral exploration and mining will emphasize the need of pursuing a sustainable mineral resources development mindset, by addressing and sharing ideas on the impact that mining has on environmental, social and economic issues including community welfare, impact of mining on land use, and rehabilitation post mining.

Geotechnical engineering 323 (SGM 323)

Module credits	16.00
NQF Level	07
Prerequisites	(SGM 311), admission to relevant programme
Contact time	1 practical per week, 2 discussion classes per week, 3 lectures per week
Language of tuition	Module is presented in English
Department	Civil Engineering
Period of presentation	Semester 2

Module content

Application of consolidation theory. Bearing capacity of soil and foundation design, Terzaghi and general methods. Horizontal stresses in soil and design of retaining structures, Rankine and Couloumb's methods. Slope stability including Bishop's method of slices. Introduction to site investigation.

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

Regulations, degree requirements and information
The faculty regulations, information on and requirements for the degrees published here are subject to change and may be amended after the publication of this information.

University of Pretoria Programme Qualification Mix (PQM) verification project

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