UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Natural and Agricultural Sciences

Fakulteit Natuur- en Landbouwetenskappe
Lefapha la Disaense tša Tlhago le Temo

Undergraduate Handbook

Department: Geology
Departement: Geologie

Guidelines for Current and Prospective Undergraduate Students

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1. Introduction

1.1. About the Department

The Department of Geology is housed in the Faculty of Natural and Agricultural Sciences on the Hatfield Campus of the University of Pretoria.

Training in Mineralogy and Mining Geology are strong in the Department and are supported by the excellent analytical facilities within the Department (XRF, XRD and electron microprobe) and the close working relationships with the mining industry.

Additional to this, the four present research focus areas of the Department are:

- Engineering Geology and Hydrogeology
- UP Natural Hazard Centre, Africa
- Carbon Capture and Storage
- Unconventional and Renewable Energy Resources.

Energy, water and environment – these are the challenging topics for geoscientists in the 21st century on a regional to global scale. South Africa's energy and mineral resources need to be addressed in the context of global resource management to ensure sustainability. Universities are the academic platform for blue sky research on the one hand, and partners for applied research in collaboration with industry on the other hand. Both approaches are necessary to provide a broad basis of knowledge to students and to produce highly competitive graduates and future leading geoscientists for the academic and professional industries, nationally and internationally.

1.2. Macro-alignment

The Department of Geology acknowledges the vision of the University of Pretoria and aims to train students at all levels to be internationally competent and locally relevant. The Department therefore focuses on a strong fundamental background applied to global and local issues of relevance.

The Bachelor's degrees offered in the Department are level 4 according to the South African Qualification Authority's (SAQA's) Higher Qualification and Education Sub Framework (HQESF). Each programme comprises 135 credits amounting to 1350 notional hours.

All degrees offered prepare the student for the honours degrees in Geology or Engineering and Environmental Geology. These honours degrees allow for professional registration with the South African Council for Natural Scientific Professions (SACNASP).

1.3. Critical Cross-Field Outcomes

The critical cross-field outcomes include, but are not limited to:

- Identifying and solving problems by using critical and creative thinking.
- Working effectively with others as a member of a team.
- Organising and managing oneself and one's activities responsibly and effectively.
- Communicating effectively using visual, mathematical and language skills in the modes of written persuasion.
- Demonstrating an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.
- Contributing to the full personal development of each learner and the social and economic development of society at large by making it the underlying intention of any programme of learning to make an individual aware of the importance of:
    - Reflecting on and exploring a variety of strategies to learn more effectively;
    - Participating as responsible citizens in the lives of local, national and global communities;
    - Being culturally and aesthetically sensitive across a range of social contexts;

- Exploring education and career opportunities; and
- Developing entrepreneurial opportunities.

1.4. About this Document

This document, the *Undergraduate Handbook* (when referred to in individual module study guides), is to be used in conjunction with the University of Pretoria's regulations, the Faculty of Natural and Agricultural Science's yearbook and the individual module study guides.

Separate study guides are available for all postgraduate courses and additional information is available on the departmental homepage at www.up.ac.za/geology. The contents of this document, however, apply to all individual modules and the contents throughout the undergraduate studies. Note also that this document is updated annually and students are required to obtain the latest version.

1.5. Careers in Geology

Career options are mostly focused around the two broad fields of mining and mineral processing, and environmental resilience and sustainable development. Within these themes, careers are possible in a variety of disciplines and industries.

Geology

Geology as an academic pursuit is concerned with the formation of the Earth and the evolution of the natural world. Geology is an empirical science at heart, concerned with making observations on all scales from microscopic through macroscopic to continental scale, and makes use of chemistry, physics and mathematics in striving to understand the world around us. Geology is split into a host of sub-disciplines, including, but not limited to, mineralogy (the study of rock-forming minerals), petrology (the study of rock formation), sedimentology (the study of water-based systems of sediment transport), and structural geology (the deformation and behaviour of rock under stress).

Mining Geology

Many geologists work for large mining companies across the globe. A mining geologist is responsible for both short-term and long-term operations on the mine. From day to day, the geologist will work to identify geological hazards (through visiting the working areas or examining borehole cores), ensure the correct material is being mined, and liaise with both the miners and the senior executives on the mine. A geologist is also involved in the long term planning for the mine, estimating the available resources and planning the best way to exploit these resources. Some mine geologists become specialists in ore resource estimation, while others may eventually work as mine managers.

Exploration Geology

Before a mine can be built, an ore deposit must be located and assessed. The exploration geologist is responsible for identifying potential ore deposits, assessing their economic value and planning the exploitation of such deposits. A variety of techniques are used in exploration geology, including geophysical and geochemical surveys, but most exploration involves a large amount of time out exploring the wilderness on foot. Once a potential deposit has been located, borehole drilling and other methods are used to investigate the deposit, and the ore resource is modelled statistically. Some exploration geologists specialise in only one part of the process, whereas others are involved at all stages. With the recent developments around unconventional and renewable energy resources, novel career opportunities in exploration geology may become increasingly prominent.

Engineering Geology

Engineering Geology is somewhat different to applied geology in that additional knowledge, education and training is required in the problems of the ground for engineering works, site investigation methods and the classification and behaviour of soils and rocks in relation to civil engineering, and therefore includes practical knowledge of soil mechanics, rock mechanics and hydrogeology (fluid mechanics). Applications of engineering geology generally relate to construction on and in (i.e. founding or

excavation) or with (i.e. construction materials) geological materials, as well as the influences of geological, geomorphological and hydrological processes on construction and development.

Hydrogeology

Groundwater hydrology or geohydrology refers to the occurrence, distribution and movement of water below the Earth's surface, whereas hydrogeology is that subdivision of hydrology referring to water below the Earth's surface with the emphasis on the geological aspects. The study of groundwater, therefore, should incorporate both the fluid (water) and the medium through which it is flowing (rock, soil or any other geological material). Groundwater – as opposed to surface water – refers to all the water occupying all the voids in the subsurface and is subdivided into the saturated or phreatic zone and the unsaturated, aeration or vadose zone. The relevance of the study of groundwater is generally quantitative (e.g. water supply, safe abstraction, influences of pumping) and qualitative (e.g. contamination, remediation, drinking water).

Environmental Geology

Environmental geology is a generic term related to two distinct subdisciplines. Firstly, *environmental* can be seen to indicate the interaction between processes and Man, and include, for instance, risk induced by subsidence, slope movements, seismic events, hydrometeorology, and so forth. A second possible definition of *environmental* relates more to the field of contaminant transport and focuses around chemical, physical, microbiological, radioactive, endocrine disruptive, organic and other forms of water and soil contamination. Specialisation in these fields are offered within the context of Engineering Geology or Hydrogeology, and often involves specialist input from Geology (e.g. quantitative mineralogy, economic geology, etc.), the Water Institute (surface hydrology, soil science, meteorology, zoology, ecology, virology, etc.) and the UP Natural Hazard Centre (e.g. risk assessment, geostatistics, seismology, etc.).

Engineering Hydrogeology and Vadose Zone Hydrology

A developing strength in the department is focused around unsaturated or vadose zone hydrology. The area between the Earth's surface and the groundwater table is characterised by pore spaces occupied with both air and water, and these dual-flow systems influence the movement of contaminants to the aquifer, water seepage through buildings and excavations, and govern the important interaction between surface water and groundwater as a fundamental component of the water cycle. Although included in the separate fields of engineering-, hydro- or environmental geology, the tendency is towards considering these as new disciplines focused around the application of water-air systems to development and the environment.

Other Options

Geologists often work in many other fields. Some forensic scientists are geologists by training, as are some metallurgists and mineralogists. Banks use geologists as risk analysts for business loans, and some geologists end up working as stock brokers at the stock exchange. Geology at its core is about evaluating evidence and making the best logical decision based on the evidence, and this skill can be transferred to many other fields.

2. Course Content

2.1. Undergraduate Programmes

Two undergraduate programmes are offered, each comprising 120 credits or 1 200 notional hours. The B.Sc. Geology progresses to a B.Sc. (Hons.) Geology, but Honours programmes in Metallurgy and Mining Engineering are also offered by the Engineering Faculty. The B.Sc. Engineering and Environmental Geology, which requires an additional major in mechanics, continues in one of four options:

- B.Sc. (Hons.) Geology

- B.Sc. (Hons.) Engineering and Environmental Geology (Engineering Geology)
- B.Sc. (Hons.) Engineering and Environmental Geology (Hydrogeology)
- B.Sc. (Hons.) Environmental Soil Science.

Students in the Department of Geology are trained for the mining, civil engineering, governmental, parastatal and private industries and include a wide range of prospective careers, including mining and economic geology, exploration geology, engineering geology, hydrogeology, rock mechanics, environmental geology, mineralogy and so forth.

Given the vocational opportunities, students are exposed to a minimum of one year of fundamental science (mathematics, chemistry and physics) and three years of geology as a major. A second major is recommended in chemistry, mathematics, physics, statistics or engineering mechanics (offered through the EBIT Faculty), or in exceptional circumstances, geography, soil science, geoinformatics or any other module relevant to geology.

2.2. Annual Learning Outcomes

The characteristics of the cognitive domain (according to DS Bloom's *Taxonomy of Educational Objectives* and DR Krathwohl's *Taxonomy of educational objectives. Handbook 1. Cognitive domain*) lists assessment sequentially as (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis and (6) evaluation. Requirements for these domains are summarised in **Table 1** and annual learning outcomes, based on this, are simplified in **Table 2**.

Table 1. Characteristics of cognitive domains.

Cognitive Domain	*Definition*	*Typical Verbs*
1. Knowledge	Recall previously learned information	Arrange, describe, identify, list, name, sketch
2. Comprehension	Grasp the meaning of information	Classify, discuss, estimate, explain, give example(s), identify, estimate, report, revise. Select, summarise, "in your own words"
3. Application	Apply information appropriately to different situations	Apply, calculate, demonstrate, illustrate, correct, prepare, give, solve, use, manipulate
4. Analysis	Dissociate the information and see the relationships	Analyse, judge, calculate, compare, criticise, deduce, differentiate, distinguish, investigate, divide, organise
5. Synthesis	Combine the components to form new products and ideas	Bring together, compile, construct, create, design, determine, develop, recommend, sythesis, plan, discuss, support
6. Evaluation	Judge an idea, theory, opinion, etceter, at the hand of criteria	Judge,compare, defend, evaluate, judge, justify, optimise, envisage, criticise

Table 2. Annual expected learning outcomes.

Study Component	*GLY 100*	*GLY 200*	*GLY 300*
Outcomes	Basic geology concepts introduced	Integrating fundamental science	Integrating subdisciplinary and fundamental theory and practice
Theory	Defining	Explaining	Appraising
Practical	Identifying	Deducing	Assessing
Understanding	Conceptual	Detailed	Applied
Thinking	Fundamental	Integrated	Holistic
Knowledge	Knowing	Understanding	Interpreting
Assessment	Single word or sentence	Essays, calculations	Debate data

First year – GLY 100

GLY 100 gives the student a broad theoretical background of the subject of geology and its most fundamental subdisciplines. Concepts of physical geology, stratigraphy, mineralogy, petrology and environmental geology are taught at a first-principles basis with applications to the South African context. Following completion of the first year, the student should know what geology is, how the planet works, how minerals and rocks are formed and identified from hand specimens, how geological maps and stratigraphic sequences work, and should be able to collate these principles into a generic understanding of geology as a subject.

Second year – GLY 200

GLY 200 gives detailed theory and practical assessment of specific subdisciplines in geology. GLY200 involves integrating the chemistry, physics and mathematics learnt in first year within a geological framework. The 2A-stream focuses on the chemical-mineralogical topics of crystal optics, mineralogy, and igneous and metamorphic petrology. The 2B-stream, on the other hand, focuses around the mechanical applications of structural geology, sedimentology and groundwater. Following successful completion of the second year, the student should be able to appraise theoretical topics in-depth and understand the intricate reasons for the behaviour of the Earth as a whole and to integrate concepts from fundamental science into understanding of geological subject matter.

Third year – GLY 300

GLY 300 forms the applications of geology and includes Geostatistics, Ore Formation, Engineering Geology and Rock Mechanics. All these modules are applicable to notably the mining environment and supply very important developing applications of geology and prepare students for the honours-level expectations. Following the third year, students should be able to integrate knowledge from the preceding modules as well as all elective modules into in-depth discussions on the applications of geology in given environments such as mining, infrastructure development, natural hazards and so forth.

2.3. Core Module Descriptions

The distribution of core modules (excluding electives) for both undergraduate programmes is shown in **Table 3**.

The individual GLY-modules described in **Table 4** – **Table 7** are compulsory for all students in the Department of Geology and under no circumstances can the bachelor degree in *Geology* or in *Engineering and Environmental Geology* be completed without successful completion of all these modules.

Prerequisites (refer to year book) to modules are enforced strictly as it is not possible to successfully complete a module without adequate background to the module contents. Additional module contents for those offered through the EBIT Faculty and pertaining to the *Engineering and Environmental Geology* programme are shown in **Table 8**.

Elaborations on module descriptions and expected outcomes are detailed in the relevant module study guides. Annual deviations may exist within context of the descriptions in the annual yearbooks and new study guides overwrite the contents and requirements of preceding study guides.

Presentation times are fixed according to the year book and timetable, unless a notice is posted on the notice board in the foyer of the Mineral Sciences building.

Table 3. Undergraduate programmes in the Department of Geology.

Term	*Quarter 1*	*Quarter 2*	*Quarter 3*	*Quarter 4*
100	**GLY 155**		**GLY 162**	**GLY 161**
	CMY 117		CMY 127	
	WTW 158 (WTW 114)		WTW 168 (WTW 128)	
	LST 110		AIM 101	
	PHY 114		(SWK 122)	
Term	*Quarter 1*	*Quarter 2*	*Quarter 3*	*Quarter 4*
200	**GLY 255**		**GLY 261**	**GLY 262**
		GLY 254	**GLY 263**	**GLY 265**
	(SWK 210)			
	GKD 250			
Term	*Quarter 1*	*Quarter 2*	*Quarter 3*	*Quarter 4*
300	**GLY 362**	**GLY 361**	**GLY 363**	**GLY 364**
	(GKD 350)		(GKD 320)	
	(SGM 311)			
Core modules in Geology; other core modules; (additional core modules for Engineering and Environmental Geology)				

Table 4. Description of first year (GLY 100) modules.

Module	*Year book Description (Prerequisites)*	*Credits*
GLY 155 Introduction to Geology	*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.*	16 (Q1+Q2)
GLY 161 Historical Geology	*Principles of stratigraphy and stratigraphic nomenclature; geological dating and international and South African time scales; Africa framework and tectonic elements of South Africa; introduction to depositional environments. Overview of the historical geology of South Africa, from the Archaean to the present: major stratigraphic units, intrusions and tectono-metamorphic events – their rock types, fossil contents, genesis and economic commodities. Principles of palaeontology and short description of major fossil groups: fossil forms, ecology and geological meaning. Geological maps and profiles; rock samples.*	8 (Q4)
GLY 162 Environmental and Hazard Geology	*Hazardous exogenic and endogenic geological processes and their influence on the human environment; impact of human activities on the geological environment; natural resource utilisation including materials for construction; natural and mine-induced seismicity; waste disposal; groundwater and environmental pollution. Geological maps; geological profiles; rock specimens; fossil specimens.*	8 (Q3)

Table 5. Description of second year (GLY 200) modules, 2A-stream.

Module	*Year book Description (Prerequisites)*	*Credits*
GLY 255 Fundamental and Applied Mineralogy	*Fundamental concepts in mineralogy, and practical applications of mineralogy, including: the basics of crystal structure; the crystallographic groups; the rules of atomic substitution; phase transitions and phase diagrams; the structure and uses of olivine, pyroxene, feldspar, amphibole, mica, aluminosilicates, garnet, cordierite, and more uncommon mineral groups such as oxides, sulphides and carbonates; the calculation of mineral formulae from chemical analyses using various methods. Practical sessions: the basics of optical mineralogy and the use of transmitted light microscopy for thin section examination of minerals and rocks; the practicals will develop mineral identification skills for the minerals covered in the lectures, and cover basic textural identification.* *(CMY 117,127; GLY 155, 161, 162; WTW 114/158; PHY 114)*	24 (Q1+Q2)
GLY 261 Igneous Petrology	*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.* *(GLY 255)*	12 (Q3)
GLY 262 Metamorphic Petrology	*Classification of metamorphic rocks. Anatexis, migmatite and granite; eclogite. Metamorphic textures. PT-time loops. Metamorphism in various plate tectonic environments.* *(GLY 255)*	12 (Q4)

Table 6. Description of second year (GLY 200) modules, 2B-stream.

Module	*Year book Description (Prerequisites)*	*Credits*
GLY 253 Sedimentology	*Introduction to sedimentology; composition, textures and classification of sedimentary rocks; flow dynamics and behaviour of sediment particles in transport systems; description and genesis of sedimentary structures; diagenesis; modern and ancient depositional environments and their deposits; economic sedimentology; field data acquisition from sedimentary rocks and writing of reports; sieve analysis; Markov analysis; analysis of palaeocurrent trends; interpretation of sedimentary successions from outcrops and boreholes.* *(CMY 117,127; GLY 155, 161, 162; WTW 114/158; PHY 114)*	*12 (Q3)*
GLY 254 Structural Geology	*Integrated theoretical and practical course dealing with the principles of rock deformation and analysis of deformed rocks. Stress, strain and rheology, joints, experimental rock deformation, fault systems and Anderson's theory of faulting. Folds and interference folding, tectonic fabrics, shear zones, progressive deformation. Stereographic projection and structural analysis.* *(CMY 117,127; GLY 155, 161, 162; WTW 114/158; PHY 114)*	*12 (Q2)*
GLY 265 Groundwater	*Origin and classification of groundwater; classification of aquifers; groundwater movement; equations for groundwater flow into boreholes; the La Place equation and solutions for pump tests; execution and interpretation of pump tests. Groundwater flow modelling; classification of aquifers in southern Africa; groundwater exploration and management. Mapping techniques.* *(CMY 117,127; GLY 155, 161, 162; WTW 114/158; PHY 114)*	12 (Q4)

Table 7. Description of third year (GLY 300) modules.

Module	*Year book Description (Prerequisites)*	*Credits*
GLY 361 Ore Deposits	*Systematic review of major metallic and non-metallic ore types and examples in South Africa and world-wide; ore type models (grades, tonnages); geometry of ore bodies; mining. Ore samples and ore mineralogy. Mapping techniques. (GLY 253, 254, 255, 261, 262, 265)*	18 (Q1)
GLY 362 Geostatistics and Ore Reserve Calculations	*Review of classical geostatistical methods; problem evaluation; descriptive statistics, normal, lognormal, three parameter lognormal distributions; confidence intervals; t-test. Sampling; cut-off values; grid generation and trend surface analysis. Semivariogram; error estimation; Kriging (BLUE) techniques. Ore reserve calculations. (GLY 253, 254, 255, 261, 262, 265)*	18 (Q2)
GLY 363 Engineering Geology	*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. (GLY 155, 265 and any four from GLY 253, 254, 255, 261, 262)*	18 (Q3)
GLY 364 Rock Mechanics	*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. (GLY 155, 265 and any four from GLY 253, 254, 255, 261, 262)*	18 (Q4)

Table 8. Description of modules presented in the EBIT Faculty.

Module	*Year book Description (Prerequisites)*	*Credits*
SWK 122 Mechanics	*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. (WTW 158)*	16 (Q3+Q4)
SWK 210 Strength of Materials	*Stresses, strains and the mechanical properties of materials: normal stress and shear stress, tension and compression, equilibrium in shear, factor of safety, design, shear strain, stress/strain diagram, Hooke's law, Poission's ratio and the shear stress/ strain diagram. Axial loads: elastic deformation, displacements, statically determinate and indeterminate structures and thermal effects. Torsion: torsion of circular bars and power transmission beding of straight members and composite beams. Transverse shear: shear in straight members and shear flow. Combined loads: thin walled pressure vessels and stresses as a results of combined loads. Stress transformation: plane stress transformation, principle stresses, maximum values and stress variation in prismatic beams. Strain transformation: plane strain transformation, principle strains, maximum values, strain gauges and rosettes and the relationship between E, G and u. Design of beams from section characteristics. Deflection of beams: the elastic curve integration method, Macauly's method and superposition. (SWK 122; WTW 168/ WTW 128)*	16 (Q1+Q2)
SGM 311 Soil Mechanics	*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. (SWK 210)*	16 (Q1+Q2)

2.4. Elective Modules

For entry into the engineering geology of hydrogeology streams, it is imperative that the required Soil Mechanics SGM 311 and all its prerequisites are taken during the undergraduate programme. In the event that the student does not envisage postgraduate studies in one of these options, electives are recommended in fundamental science such as mathematics, chemistry or physics, or in alternative second majors such as soil science, geoinformatics or statistics.

2.5. Educational Approach

In terms of the educational policy of the University it is accepted that "a student should undergo an academic-scientific moulding as to be able later in professional context to function as an independent scientist and to contribute to the creative development of the chosen profession... in effect it refers to a purposeful and pro-active education approach which brings with it a change in emphasis from the traditional lecturer-centred teaching approach to a more dynamic student-centred learning approach." (A new approach, Tukkie-onderrig, Vol. 1(2), 1986). A syllabus for this programme has accordingly been developed as worded in this study guide.

3. Lecturing and Support Staff

3.1. Student Administration

Student matters are handled by Ms Mmantwa Senyatsi in room 3-48 of the Mineral Sciences Building. All queries can be directed to her during her office hours.

Note that all queries regarding SWK and SGM modules have to be directed to the EBIT Faculty.

3.2. Lecturing Staff

Details and short curriculum vitae of all lecturing staff are available on the departmental homepage under *Staff.* Contact details and field of expertise are listed in **Table 9**. Students are encouraged to use to acquire contact information and research interests prior to contacting staff.

Table 9. Lecturing staff.

Staff member	*Office **	*Email*	*Description*
Prof Adam Bumby	MS 4-24	adam.bumby@up.ac.za	Structural Geology
Prof Louis van Rooy	NS II 4-25	louis.vanrooy@up.ac.za	Engineering Geology
Prof Roland Merkle	MS 4-40	roland.merkle@up.ac.za	Applied Mineralogy and Economic Geology
Prof Wlady Altermann	MS 3-50	wlady.altermann@up.ac.za	Kumba-Exxaro Chair in Geodynamics
Dr James Roberts	MS 4-41	james.roberts@up.ac.za	Igneous Petrology
Dr Matthys Dippenaar	NS II 4-34	matthys.dippenaar@up.ac.za	Engineering- & Hydrogeology
Dr Nils Lenhardt	MS 4-38	nils.lenhardt@up.ac.za	Physical Volcanology
Mr Victor Tibane	MS 4-36	victor.tibane@up.ac.za	Geophysics
Vacant post			Sedimentology
Vacant post			Hydrogeology
Vacant post			Metamorphic petrology
* MS – Mineral Sciences Building; NS II – Natural Sciences 2 Building			

Staff members are available only by appointment made via email, or at the times stipulated on their office doors for consulting. Students should respect that research and postgraduate students also require time and that lecturers cannot be available at any given time of day, even when in the office.

Demonstrators and tutors are used to improve contact during practical sessions. For a given module, the demonstrators and tutors compliment the functions of the lecturer and all work covered form part of the learning outcomes for the course.

3.3. Course Coordinators and Class Guardians

Lecturers can be contacted directly regarding modules presented. All contact details are available under *Staff* on the departmental homepage. Class Guardians for the respective years of study are:

• First year Geology	Prof W Altermann
• Second year Geology	Dr. RJ Roberts
• Third year Geology	Dr N Lenhardt
• Engineering faculty students (civil & mining)	Mr BR Jones
• Engineering and Environmental Geology Honours	Dr MA Dippenaar
• Geology Honours	Prof AJ Bumby
• IGL 703	Prof JL van Rooy
• All Departmental MSc's and PhD's & MSc Applied Mineralogy	Prof RKW Merkle

4. Admission and Re-registration

The following definitions apply:

- Admission: into the programme, following completion of secondary education, as per University and Faculty requirements
- Re-registration: into the same programme in a subsequent calendar year for the same or following academic year
- Progression: into the same programme in a subsequent calendar year for the subsequent academic year (e.g. from 200-level to 300-level).

4.1. Admission to the Programme

Admission procedures are documented in regulation G.1 and are influenced by the Faculty front desk and the Client Service Centre. On successful registration, the student will be informed on the arrangements and schedules for the first meetings.

4.2. Re-registration for the Programme

Re-registration is permitted only "if the student has passed at least the equivalent of four semester modules in a particular year of study" (regulation G.3.2.a) and "if the student completes the degree for which he or she is still registered within the prescribed minimum period plus two years" (regulation G.3.2.b). This implies that students will not be allowed to re-register for a programme in the Department of Geology if:

- Four semesters or eight quarters weighted according to the credits of the annual geology modules are not passed in a given year (i.e. 64 at 100-level or 96 at 200-level in a given academic year)
- The student fails to be promoted to a subsequent academic year following the fifth year of enrolment (given the generic first year, academic performance from all programmes within the Faculty of Natural Sciences and EBIT will be considered), including the extended programme.

Admissions (first registrations) and re-registrations are not the prerogative of the Department of Geology. All these matters are referred to the Client Service Centre and the Faculty of Natural and Agricultural Sciences.

4.3. Academic Progression

Additional to being allowed to re-register into the study programme, a student will only be allowed to promote to the following academic year if s/he passed more than 100 credits for a particular year of study (Faculty yearbook regulation Sc. 3) as well as all core modules of the preceding year.

Lack of prerequisites and poor academic performance may result in reapplications being denied. In the event that courses are oversubscribed, students with poor academic records and continuous poor academic performance will not be allowed back into a particular year of study.

Prerequisites are enforced rigidly and under no circumstances will students be allowed to progress to a subsequent module or year of study when all prerequisites are not met. Apart from the lack of adequate understanding of principles when such modules are failed, the work load becomes too high and compromises academic performance in other modules. For this reason, the "dean may … cancel the registration of a student or the registration for a module during an academic year if the student fails to comply with the minimum requirements determined by the faculty board with regard to tests, examinations or any other work" (regulation G.4).

Should a student fail to progress to a subsequent year of study for any reason whatsoever (including failure to re-register, failure of modules, non-compliance with minimum requirements), the student is considered to have interrupted his or her studies and forfeits the right to continue studies according to the regulations and requirements set in the first year of study. Such students may be expected to redo any modules no longer offered or in which the content has changed without credit to modules no longer accepted in the programme (regulation G.5).

A student will not be informed of his/ her marks, allowed perusal, or have the credits allocated, if a student cannot provide proof of registration and/ or if tuition fees are outstanding (Faculty yearbook regulation 5).

A student will, furthermore, be refused to progress academically if any study materials are outstanding, including but not limited to: library materials, lecturer's books or articles, maps, GPSs, and so forth.

4.4. Repetition of Modules

Should a student fail a particular module and be allowed to re-register for the module, s/he is obliged to attend the complete module (Regulation G.11.2.a). Given that failure to pass a module proves lack of thorough understanding of the module contents, no exemption to class attendance, tests, assignments, practicals, field excursion or other components of study will be granted.

4.5. Timetable Clashes

In the event of timetable clashes due to, for instance, repetition of modules or choices of electives, the student will be expected to prioritize lower level academic major subjects at the expense of higher level subjects or electives. Courses offered during the same timetable sessions cannot be enrolled for simultaneously as no exemption or alternative sessions will be arranged.

4.6. Prerequisites

Absolutely no prerequisites will be signed away. Prerequisites are put in place to ensure previous learning is in place for successful completion of the modules.

5. Communication and Contact Sessions

5.1. Offices and Lecture Venues

Lecture venues are listed in the timetable book and will be used as stipulated unless noted otherwise on the notice boards.

Offices of lecturers and support staff are mainly situated in the Mineral Sciences Building, Natural Sciences 2 Building, and Stoneman Building.

An interactive campus map is available on the University's homepage for directions.

5.2. Announcements

The notice boards are at the entrance of the Mineral Sciences Building and in the passage on level for of the Natural Sciences 2 Building. Either of these notice boards, ClickUP or announcements during lectures will be used to communicate matters with the class.

5.3. Class Attendance

According to University policy, "a student may register for a module only if the official class timetable allows the student to attend all the classes" (regulation G.2.3).

Lecture and practical attendance is compulsory. For this reason, no lectures or practical sessions will be repeated as this negatively impacts on the rest of the students in the class. Absence from lectures and practical sessions without proper reason will require from the student to obtain the information and announcements from the relevant session. Timetable clashes will not be acceptable as an excuse.

Each credit allocated to a module amounts to ten hours of learning. This implies that all modules require extensive self-study as well as preparation for tests and examinations.

5.4. Class Representatives

It is the duty of the class as a whole to elect (by majority vote of those present) a class representative to act as mediator between the lecturer and the class. Communication is preferred through this pathway and the class representative will serve to communicate important notifications during lecture sessions.

The class representative will be appointed based on evaluation of his/ her academic record. It is expected that a class representative performed academically and has, at the time of appointment, passed all previous academic semester modules, and has registered for all geology modules within a given academic year (e.g. all 100, 200 or 300 level modules) within the same calendar year (e.g. 2015, 2016 or 2017).

5.5. Absence

Where applicable, the following applies to absence from scheduled contact sessions and evaluation opportunities, and will be applied strictly and without exception.

Absence from module tests:

Official test dates are set in the test timetable or are announced during lectures and/ or practicals. If you are absent as a result of illness, a medical certificate must be handed in within 72 hours after the test or practical. If you are absent for other legitimate reasons, the reasons must be provided in the form of an affidavit or sworn statement within 72 hours of the formal test date. Note should, however, be taken that a medical certificate is the only accepted reason for absence according to the University of Pretoria's regulations and any other reasons are within the prerogative of the lecturer and Head of Department concerned. Learners are urged to not miss tests for any reason other than illness, or to discuss other issues not relating to health with the lecturer prior to the test date.

In the event of semester or module tests, these documents have to be submitted to the lecturer within 72 hours of the scheduled test time. A decision will then be taken whether the reason is valid and a time for the re- or sick test will be set for the group as a whole. If the reason for absence is not accepted by the lecturer, the decision is final and no alternative arrangements will be made.

In the event of two module tests, it is acceptable that the lecturer offers a single opportunity following the second test. In the event of absence from both module tests, this sick test will count towards the test

contributing the greatest proportion to the final module mark. In such instances, a zero mark will be allocated for the other test missed.

Absence from excursions and practical field days:

No excuses will be accepted for absence from the excursion and practical field days as attendance of these sessions are vital to the contents of this course. In the event of absence from either of these compulsory activities, the prerequisites for passing the module will not be met and the excursions and/ or practical field days will have to be repeated in a later year. Note that weekends form part of the academic week and students are expected to arrange availability on such days.

Absence from the exam period:

This has to be submitted to the Faculty Administration directly as the lecturer cannot approve sick exams or supplementary exams. No sick exams will be granted by the Faculty Administration unless a sick note was submitted to the Faculty directly within 72 hours of the official exam period. The lecturer does not have the right to grant supplementary exams and this has to be discussed with the Faculty. The lecturer also will not mediate between the learner and the Faculty regarding these matters. As per University regulations, no supplementary or ancillary examinations will be granted on sick exams.

Absence from sick, supplementary, re- and/ or aegrotat tests and exams

No excuses will be accepted for absence from any second opportunity of assessment, including (but not limited to) ancillary class tests or exams, sick tests or exams, re-tests or re-exams, or aegrotat tests or exams. Given that all of these represent second opportunities, absence from these assessments will not be discussed or reconsidered.

Late submissions of written assignments:

Late submissions (if applicable) are inexcusable as ample time is supplied for timeous submission via ClickUP. Late submissions will result in a zero mark for this component. The deadlines supplied for written assignments should be viewed as the absolute latest submission time, and learners are urged to submit assignments well in advance.

5.6. Absence of Lecturer

In the event that a lecturer – due to unforeseen circumstances known in advance – is not able to present a lecture or practical session, this will be made known via ClickUP before 16:00 on the day prior to the contact session. If the lecturer is not able to attend such contact sessions at short notice, a replacement lecturer will be arranged if possible, or alternatively the class representative will be informed of the cancellation of the lecture or practical. It is then the responsibility of the class representative to announce this at the beginning of the contact session or to post a notice at the entrance to the venue. Where possible and necessary, the lecturer will arrange for an additional session to catch up on the lost course contents.

The class representative will have the lecturer's contact details to ensure continuous communication in such instances.

6. Lecture Materials

Prescribed and recommended textbooks form the basis of most of the relevant course contents. It is the students' prerogative to acquire these vital references or to peruse the materials in the library.

Class notes are a privilege offered by the lecturing staff. Students should realise that it is their duty to take notes and to use the prescribed and recommended study materials to compliment lecture presentations, and to take notes during the contact sessions, even if the lecture presentations are not made available. Lecturers by no means are required to make lecture presentations available and are free to deviate from prepared lectures to better cover topics of interest or areas of concern raised by students.

A student should not expect to study solely from the lecture presentations, and the lecturer has the right to examine topics covered in the classes but not provided in the lecture notes.

Standard geology materials for field work have to be obtained by the student. These include, for instance, a geological hammer (pick), magnifying glass and tape measure. Compasses and handheld GPS devices are available in the department.

The textbook published jointly by the GSSA and the CGS on the *Geology of South Africa* supplies vital background to all students enrolled for programmes in the department.

7. Plagiarism

Plagiarism refers to the appropriation of the work or ideas of others. Plagiarism is both unethical and illegal and may be regarded as a criminal offence in terms of the Copyright Act 98 of 1978. The University of Pretoria places a high premium on its academic standards and subscribes to a value system that requires strong action against plagiarism. Being regarded as a serious contravention of the University's rules, plagiarism can lead to expulsion from the University. For more information, see http://upetd.up.ac.za/authors/create/plagiarism.htm and Appendix A.

Plagiarism for written assignments is evaluated through Turnitin. Turnitin is a powerful antiplagiarism tool, but it does require some thought in using it properly. Basically, the system runs a piece of work against its database, and highlights all cases where a sequence of words matches a previously published work (the length of the sequence can be set by the user – default is 3 words in a row). The system then collates the number of words taken from a certain work, and compares this word count to the total word count in the paper to calculate a percentage (i.e. 300 words out of 3000 words= 10% for that source). The system will then calculate a gross plagiarism score, the Similarity Index, from the sum of all the different sources. Thus, 50 different sources each with 1% plagiarised will yield a Similarity Index of 50%, but so will 2 sources of 25% each. Thus, a lecturer cannot simply make judgements based on the Similarity Index- the plagiarism counts for individual sources must be examined.

Therefore the following values will be used to judge plagiarism in the Geology Department:

- Turnitin will be set to look for matching sequences of 3 or more words
- The bibliography/references will be excluded from the match
- The student may be allowed to run each piece of work through Turnitin ahead of the submission date, according to the lecturer's discretion.
- No individual source may contribute more than 3% to the total
- The overall similarity index must be 25% or less, unless all individual sources contribute less than 1% each to the total.

Contravention of these guidelines will result in disciplinary action. In the event that disciplinary action is avoided, resubmission prior to the newly established deadline will result in a maximum mark of 50%, and late resubmission will result in legal action.

8. Marks and Examination

8.1. Submission of Assignments

The lecturer will specify the format of submissions for assignments. Unless specified otherwise, the following are acceptable formats of submission (all in accordance with general reporting guidelines of the department):

- Hard-copy printed and stapled or ring-bound
- Electronic emailed or submitted via ClickUP as a Word document with an extension ".docs" (not "dot", "doc", "rtf", "txt", or any other format)
- Portable digital file emailed or submitted via ClickUP with an extension ".pdf".

Electronic files have to be named in the following manner: MODULE_YEAR_SURNAME_ASSIGNMENT (e.g. GLY363_2016_Smith_Prac03). If these requirements are not met, the assignment will not be assessed.

In the instance of group work, the Group Number replaces the surname and all group members' names should be indicated on the front page of the submission (e.g. GLY363_2015_Group03_Prac03).

Refrain from using generic file names such as DOCUMENT1, ASSIGNMENT1 or GLY363 as duplicate names make appropriation of assignments difficult.

In the event of submitting Word documents, refer to the style sheet and formatting guidelines used in the department. It is important to align all images with the text (i.e. do not place in front of the text) and to compress all images prior to submission.

8.2. Module Marks

Calculation of module marks will be documented in the relevant module study guides. Entry into the examinations are based on:

- Subminimum module mark of 40%
- Subminimum practical mark of 40% for 100-level modules and 50% for 200-level and 300-level modules
- Attendance of all contact sessions, including lectures, practicals, discussion classes and excursions.

Students cannot contest module marks after the last day of the module. Lecturers cannot and will not change any marks, even if mistakes were made, as these have to be finalised during the course of a module. It is the student's prerogative to ensure that marks made available by the Faculty is correct before commencement of subsequent modules or examinations.

8.3. Examinations

Examination dates are set and no dates will be moved. No alternative dates will be made where clashes occur or where more than one paper is written on the same day. Students are not allowed to register for modules where clashes in the timetable occur, and examination dates will not clash if students register early on. No notes form other lecturers will be accepted as reason to grant special examinations at other dates and times, and no extracurricular activities will be acceptable reason for absence.

A student can only pass a given module if both the year (module) mark and the examination mark are above 40% and if the final mark, calculated as per relevant module study guide, is above 50% (Faculty regulation 6.2).

Entrance to examinations may be refused without, but not limited to: (1) proof of a valid student card, (2) failure of prerequisites (e.g. prerequisite module not passed), and/ or subminimum requirements (e.g. practical marks, module marks, absence from excursions). The following module mark subminima have to be met in order to sit for an examination:

- 1st year 1st semester (e.g. GLY 155) – 30%
- 1st year 2nd semester and complete 2nd and 3rd years – 40%
- Practical marks of 50% for all modules
- Acceptable class attendance (at least 90%) based on spot roll calls and/ or using clickers throughout the module.

8.4. Sick and Special Tests and Examinations

Entry into sick tests are subject to §5.5, unless noted otherwise in the module study guide.

Entry into **sick examinations** is approved by the Faculty based on timeous submission of required documentation (i.e. medical certificate within 72 hours of official exam time). The mark calculated in the event of a sick examination takes into consideration the module mark. If a student has sat for an

examination, s/he is not liable to sit for a sick or special examination based on (a) undisclosed illness at the time of the examination, (b) having been underprepared, or (c) any other undisclosed special circumstances (Regulation G12.7).

Entry into **special examinations** (including supplementary, ancillary, aegrotat and/ or re-) is approved by the Faculty and/ or Department and is based on marks obtained for the preceding assessment of the module (i.e. examination). A maximum final mark of 50% can be achieved (Faculty yearbook regulation 6.5).

Supplementary examinations are usually written and cover the same subject matter as for the examination. Examination marks are submitted to the Faculty and the student will be informed of a supplementary examination by the Faculty. Module marks are not taken in consideration for supplementary examinations.

Ancillary examinations are used to adjust examination marks and such examinations are taken prior to submission of the marks to the Faculty. The final mark is based on the adjusted examination mark and the module mark.

Where sick or special examinations are not made known by the Faculty, the student will be informed directly by the lecturer regarding the time, date and scope. This information is also fixed and cannot be debated.

Absence from any sick or special exam results in a zero mark and no alternatives are available.

Requirements for supplementary and ancillary examinations are as follows:

- 100-level modules – final mark between 40% and 49% AND module and practical marks above the subminimum of 40% (or 30% for GLY 155)
- 200-level and 300-level modules – final mark between 45% and 49% AND 40% subminimum for the module mark AND 50% subminimum for the practical component.

In the event of a student requiring one semester course or two quarter courses amounting to no more than 36 credits combined to graduate, a written request can be submitted to the Faculty Administration regarding **Dean's special examinations**. These have to be approved by the relevant lecturers and will not be allowed if the number of modules or credits exceed those stipulated above. A single date will be scheduled during the following January for all such examinations for GLY modules.

8.5. Contesting of marks

The lecturer(s), tutor(s) and demonstrator(s) will not enter into discussions related to improving poor marks, remarking assignments or scripts, or adjusting marks without discreet proof of error in assessment. A student may only contest marks if it can be proven – at the hand of model answers, memoranda, lecture notes, textbooks or counting errors – that a mistake was made in the calculation of the mark.

8.6. Perusal and remarking

Students have the right to perusal of examination scripts within the period announced by the relevant lecturer. Minor mark changes will not be submitted to the Faculty. Only the following result changes will be submitted:

- Exam mark below 40% becoming 40%
- Exam mark below 50% becoming 50%
- Exam mark below 75% becoming 75%
- Mark changes resulting in a final pass mark as opposed to a fail or a special exam
- Mark changes resulting in granting a special exam as opposed to a fail
- Mark changes resulting in final cum laude mark.

Lower final marks will also be submitted, should perusal indicate that too high marks were awarded.

Should the student wish to have minor changes submitted to Faculty, or if the student is still not content with the marks, a remark can be requested from the Faculty where an independent lecturer (moderator) will remark the script.

Note that a single perusal session will be announced and that no alternative arrangements will be made, regardless of reason for absence from perusal.

Given the privilege of being able to contest marks, the student should acknowledge that the lecturer reserves the right to submit lower marks to the Faculty as well following perusal or remarking. Both perusal and remarking open re-evaluation of marks to all parties, and students are not allowed to contest lower marks submitted by the lecturer or moderator.

Rules for perusal are the same as for examinations. No stationary or mobile phones are allowed; no extension will be given to perusal outside of announced sessions; and these sessions do not serve to contest marks.

Requests for remarking have to be submitted to the Faculty within 14 calendar days of commencement of the following semester, accompanied by proof of payment of the prescribed fee (Faculty regulation 6.4).

9. Entry into Honours

Entry requirements for the honours programmes, as per Faculty Yearbook, are as follows:

B.Sc. Hons. Geology

A BSc degree in Geology with an average of 60% for all the geology modules on third year level. In the selection procedure the candidate's complete undergraduate academic record will be considered. The positions available are limited to 25 and candidates who have progressed faster through their undergraduate degree will take preference. Outside applicants and those with unusual degree structures may be admitted after examination of their academic records and at the discretion of the head of department.

B.Sc. Hons. Engineering and Environmental Geology:

A BSc degree in Geology or Environmental and Engineering Geology with an average of 60% for all the modules in applied geology at second year and third year level. These modules must include soil mechanics, rock mechanics, engineering geology and hydrogeology. In the selection procedure the candidate's complete undergraduate academic record will be considered. The positions available are limited to 15 and candidates who have progressed faster through their undergraduate degree will take preference. Outside applicants and those with unusual degree structures may be admitted after examination of their academic records and at the discretion of the head of department.

10. Ethical Behaviour

It is expected from students to behave in an ethical and considerate manner. For this purpose, the following should be noted:

- Lecturers supply their personal contact details for communication pertaining to the study programme. Standard office hours apply and no telephone calls will be answered outside of these times or when the lecturer is not available. No text messages or instant messages will be answered and only telephone calls at reasonable times will be responded to.
- Email is still the preferred mode of communication. Given present technology, response via email can be traced and can be within reasonable time. All queries should be directed to the lecturer's official University of Pretoria email address and reasonable time should be allowed for response.
- Lecturers will not be available for consultation on the day of tests, seminars or other official meetings. Lecturers should not be contacted at night and no rude comments about non-response will be tolerated.

- Students are under no circumstances allowed to mention or post comments or images of lecturers or fellow students on the Internet or on any social medium (e.g. Facebook, Twitter, LinkedIn, YouTube). Failure to comply with this will be acted on as it may compromise the image of the individuals or the University in general and will be dealt with appropriately, for instance, as libel or harassment.
- Any other ethical misconduct, including for instance prejudice or plagiarism (refer to APPENDIX A), will be submitted to the University's office responsible for conflict resolution and they will decide the outcome.
- Grievances can be aired to the relevant class guardian, course programme supervisor or the head of the department who will guide the student regarding the proper channels towards resolution.

11. Important Dates

First quarter:

Monday 25 January (first years) OR Monday 1 February (seniors) to Friday 18 March

Second quarter:

Monday 4 April to Wednesday 25 May

Tuesday 26 April – Wednesday timetable

Monday 2 May – no lectures

Third quarter:

Monday 18 July to Tuesday 6 September

Second year excursion (GLY265): Saturday 6 August OR Saturday 20 August, departing 07:45 from Sci-Enza and returning 15:00

Fourth quarter:

Wednesday 7 September to Wednesday 2 November

Monday 8 August – Friday timetable

Wednesday 14 September – Spring Day

Recesses:

Saturday 19 March to Sunday 3 April

Saturday 24 June to Sunday 17 July

Saturday 1 October to Sunday 9 October

Information Sessions:

To be scheduled

APPENDIX A. DECLARATION ON PLAGIARISM

The ***Department of Geology (University of Pretoria)*** places great emphasis upon integrity and ethical conduct in the preparation of all written work submitted for academic evaluation. While academic staff teaches you about referencing techniques and how to avoid plagiarism, you too have a responsibility in this regard. If you are at any stage uncertain as to what is required, you should speak to your lecturer before any written work is submitted.

You are guilty of plagiarism if you copy something from another author's work (e.g. a book, an article or a website) without acknowledging the source and pass it off as your own. In effect you are stealing something that belongs to someone else. This is not only the case when you copy work word-for-word (verbatim), but also when you submit someone else's work in a slightly altered form (paraphrase) or use a line of argument without acknowledging it. You are not allowed to use work previously produced by another student. You are also not allowed to let anybody copy your work with the intention of passing if off as his/her work.

Students who commit plagiarism will not be given any credit for plagiarised work. The matter may also be referred to the Disciplinary Committee (Students) for a ruling. Plagiarism is regarded as a serious contravention of the University's rules and can lead to expulsion from the University.

The declaration, which follows, must accompany all written work submitted while you are a student of the ***Department of Geology (University of Pretoria)***. No written work will be accepted unless the declaration has been completed and attached.

I, the undersigned, declare that:

1. I understand what plagiarism is and am aware of the University's policy in this regard.
2. I declare that this assignment (e.g. essay, report, project, assignment, dissertation, thesis, etc.) is my own original work. Where other people's work has been used (either from a printed source, Internet or any other source), this has been properly acknowledged and referenced in accordance with Departmental requirements.
3. I have not used work previously produced by another student or any other person to hand in as my own.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.
5. I understand the Department of Geology's policy on plagiarism and the criteria set for using Turnitin by the Department.
6. I acknowledge that I am allowed to use Turnitin to evaluate my own work prior to submission.

Full names: _____

Student number: _____

Date submitted: _____

Topic of work: _____

Signature: _____

Supervisor: _____