



**MSc Mineral
Geosciences and Mining
Study Guide
2025 - 2028**



STUDY GUIDE
MASTER OF SCIENCE DEGREE PROGRAM
MINERAL GEOSCIENCES AND MINING
2025 – 2028



ANTON DE KOM UNIVERSITY OF SURINAME
FACULTY OF TECHNOLOGY
DEPARTMENT OF GEOSCIENCES

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EXECUTIVE SUMMARY

This document describes the MSc program Mineral Geosciences and Engineering (MGM) with the aim of providing students with information about the program structure, content and key academic expectations.

Given Suriname's natural resources an increasing need of expertise is demanded, focusing on the field of applied geosciences at an international academic level. In line with the university's policy to improve academic degrees, the Department of Geosciences has developed this master's program. The expectations are that the program will serve the needs of the mineral industry as well as private and government institutions involved in the management of natural resources.

The MSc program MGM emerged from a thorough revision of the former Mineral Geosciences (MGs) program. Since the last MGs cohort in 2015, no new intake had taken place. With the launch of the MGM program, the department aims to revitalize its contribution to academic research and education within the university, while also supporting the advancement of specialized knowledge in Suriname's mineral industry.

The interdisciplinary curriculum covers key aspects of mineral exploration and mine engineering with special emphasis on the Precambrian Guiana Shield. Fundamental geosciences, resource estimation and sustainability are integrated throughout, e.g., from geological processes and ore formation to economic evaluation of mineral deposits.

The present curriculum consists of 16 individual courses, followed by a six-months period of independent research culminating in a master's thesis. Individual courses are given in partnership between university staff and visiting lecturers from foreign universities. The total program is designed to be flexible depending on the availability of lecturers and the need expressed by the industry. In parallel, efforts are made to build local capacity through the involvement and training of Surinamese lecturers, ensuring the long-term sustainability of the program.

With a strong commitment to international competitive standards, this MSc program is designed and evaluated to ensure and maintain a high-quality. The program will be formally accredited following an internationally recognized procedure to be coordinated by the "Nationaal Orgaan voor Accreditatie", further referred as NOVA (Ministry of Education, Science and Culture).

The program receives financial support from Founders Metals Inc., whose sponsorship contributes to the further development of this academic initiative.

INTRODUCTION

Suriname's economy is dependent on natural resources. In parallel, the global demand for minerals and metals continues to rise as societies move toward greener energy technologies.

This accelerating demand highlights an urgent need for highly skilled professionals who can contribute to local content development and ensure that the exploration and extraction of mineral resources in our country is conducted sustainably and responsibly.

The MSc Mineral Geosciences and Mining program prepares the next generation of geoscientists and mining engineers to lead the sector both within Suriname and internationally.

This broad and interdisciplinary study covers key aspects of mineral exploration and exploitation with special emphasis on the Precambrian Guiana Shield. Geosciences and economics are integrated at various scales, from magmatic processes and ore formation to economic evaluation of mineral deposits. Teaching is closely related to research activities at the department, covering a wide range of disciplines such as petrology, mineralogy, geology of crystalline terrains, geochemistry, geophysics, geostatistics, sustainable developments of mineral resources and economics of ore deposits. To enhance the scientific level of the students, a special course on academic skills has been added at the beginning of the MSc course. These skills are implemented and complemented during the following courses.

The master program in Mineral Geosciences and Mining is intended for students with any background in the Earth Sciences. As a broad, interdisciplinary, and profession-oriented study, it prepares students for a career in the minerals industry, government and research institutions, private consultancies, and associated activities.

COURSE AIMS AND LEARNING OUTCOMES

COURSE AIMS

- To develop graduates with a profound understanding of geological or engineering aspects of mineral resources and mining.
- To foster advanced skills in the exploration, evaluation, and sustainable development of mineral resources.
- To prepare graduates to critically address technical, economic, environmental, and social challenges related to mining and mineral resources.
- To train students in scientific research methods, professional communication, teamwork, and ethical responsibility.
- To cultivate a mindset of lifelong learning and continuous professional development.

The program combines theoretical and practical components tailored to two specialization tracks: **Mineral Geology** and **Mine Engineering**. Across both tracks, students are equipped with the skills and knowledge to address scientific challenges across the mineral industry. The curriculum provides a fundamental understanding of ore-forming processes and develops insight into mining from an economic and environmental perspective.

For students specializing in **Mineral Geology**, the focus is on the exploration and evaluation of mineral prospects. Key skills include rock and mineral analysis through hands-on training in petrography, exploration geochemistry, structural geology, and fieldwork.

For students specializing in **Mine Engineering**, the focus is on the technical and operational aspects of mine design and development. Students gain insight into engineering principles underlying safe, efficient, and sustainable mining operations. Key skills include practical skills in mine planning and design through project-based assignments that simulate industry practices.

LEARNING OUTCOMES

Graduates of the program will:

1. Possess advanced knowledge of the formation of mineral systems with a focus on greenstone belts, resource estimation methods and reserve classification
2. Be able to conduct independent scientific research and contribute to innovation in the field.
3. Effectively communicate complex scientific and technical information to both specialist and non-specialist audiences.
4. Collaborate effectively in multidisciplinary and international teams.
5. Apply ethical reasoning and demonstrate awareness of the social and environmental dimensions of mining.
6. Demonstrate readiness for professional practice or doctoral-level research.

Graduates specializing in Mineral Geology will:

1. Demonstrate in-depth knowledge of the geological processes involved in ore formations and be able to apply different exploration techniques to identify ore deposits

Graduates specializing in Mine Engineering will:

1. Demonstrate the ability to plan and design mining operations with appropriate consideration of safety, environmental sustainability, and economic viability.

PROGRAM STRUCTURE

The study consists of 2½ year of courses (90 ECTS) and half a year of independent research for a master thesis (30 ECTS). Program structures for both specializations are displayed in Table 1 and 2. To accommodate students with work obligations, the courses will be scheduled from 16:30 to 21:00 hrs.

Table 1. Program structure *Specialization: Mineral Geology*

Year	Code	Course	ECTS
01	GW706	Structural Geology and Tectonics	7
	GW700	Academic Skills	3
	GW705	Greenstone Belts Through Time and Metallogeny	7
	GW804	Fieldwork Marowijne Greenstone Belt	3
	GW805	Mineralogy and Petrology	7
	GW807	Magmatic - hydrothermal processes and ore formation	7
	GW704	Mineral Systems and Metallogeny	6
02	GW912	Geophysical exploration of Mineral resources	5
	GW910	Geochemical Exploration Methods and Analytical Techniques	5
	GW914	Advanced Metamorphic Petrology	5
	GW1005	Structural Geophysics	5
	GW1008	Mineral Reserves Assessment and Geostatistics	7
	GW1009	Economics of Mineral Reserves and Mining	7
	GW1007	Sustainable Development of Mineral Resources	6
03	GW1102	Professional Practice in Geoscience	3
	GW1103	Fieldwork Brazil	3
	GW1100	Project Proposal	4
	GW1200	Thesis - Independent Research Project	30
		Total ECTS	120

Table 2. Program structure *Specialization: Mine Engineering*

Year	Code	Course	ECTS
01	GW803	Fundamentals in Mine Engineering	7
	GW700	Academic Skills	3
	GW705	Greenstone Belts through Time and Metallogeny	7
	GW804	Fieldwork Marowijne Greenstone Belt	3
	GW806	Surface and Underground Mine Planning and Design	7
	GW911	Mine Rock Mechanics	7
	GW704	Mineral Systems and Metallogeny	6
02	GW808	Advanced Drilling and Blasting	5
	GW913	Mine Mechanization and Material Handling	5
	GW915	Mine Drainage and Dewatering	5
	GW1006	Mine Ventilation	5
	GW1007	Sustainable Development of Mineral Resources	5
	GW1008	Mineral Reserves Assessment and Geostatistics	7
	GW1009	Economics of Mineral Reserves and Mining	7
03	GW1100	Project Proposal	4
	GW1103	Fieldwork Brazil	3
	GW1102	Professional Practice in Geoscience	3
	GW1200	Thesis - Independent Research Project	30
		Total ECTS	120

LECTURERS, INSTITUTE BUILDING AND FUTURE PERSPECTIVE

Currently, the Department of Geosciences is inadequately staffed and equipped to provide this type of training independently. Therefore, teaching is conducted in cooperation with partner universities in the Netherlands, Ghana, Australia, Brazil, France and the United States. Combined with the expertise available at the Department, the involved teaching staff will gain substantial experience in mineral geosciences education. To enhance the scientific qualifications of the teaching staff, several members have commenced PhD studies. It is anticipated that these individuals will gradually replace the foreign lecturers in due time.

Use will be made of existing laboratory facilities in the country and/or neighboring countries to avoid duplication of equipment. It is also a fact that maintaining and operating sophisticated laboratory equipment in Suriname is extremely challenging. The establishment of a geological laboratory should, therefore, be carefully planned.

STUDENT COUNSELOR

The student counselor provides optimal guidance and support to students during their academic career, ensuring that their studies progress smoothly and successfully. You may contact the counselor if your study is at risk of being jeopardized and you wish to discuss this (sounding board function). If you are unable to resolve an issue independently, you may request assistance (counseling function). Furthermore, if you encounter personal, domestic, study-organizational, or institutional issues and require guidance, a second opinion or mediation, you are encouraged to contact the student counselor.

To request assistance, follow the procedure below in given order:

1. In preparation for the interview, fill in the intake form online via <https://bit.ly/intakeformMSc>.
2. Make an appointment online via <https://bit.ly/maakafsppraakmetstudentendecaan>.

If you are unsure whether you need to consult the student counselor regarding a potential issue or any other specific matter, please do not hesitate to contact the counselor via the contact information below:

Student Counselor	Drs. Denise Sumter Building 17, Room 52 – Faculty of Technology Anton de Kom University of Suriname Tel.: +597 8988701 Email: Denise.Sumter@uvs.edu
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INTERACTION WITH THE INDUSTRY

Exposure to the mineral industry, as well as research and thesis projects are closely coordinated with mining companies operating in Suriname. They provide data, practical training sites, and facilities. Traineeships/internships will further enhance students' practical experience.

COLLABORATION WITH OTHER UNIVERSITIES

As specialized expertise is currently not available in-house, lectures are given by renowned geoscientists from international universities and industry professionals. These include lecturers from Utrecht University, the University of Western Australia, Universidade Federal de Minas Gerais, University of Freiburg, University of Ghana, University of Mines and Technology, Twarka, Kansas State University and Universite de Toulouse.

PROGRAM COORDINATION/ADMINISTRATION

Program Coordinator	Fydji Sastrohardjo, MSc. Building 7 - Department of Geosciences Tel: +597 465558 Ext. # 2430 M: +(597) 814-4440 E-mail: Fydji.Sastrohardjo@uvs.edu
Administration	Lynette Afindoe Building 7 - Department of Geosciences, Faculty of Technology Anton de Kom University of Suriname Leysweg 86, POB 9212 Tel: +597 465558 Ext. # 416 E-mail: Lynette.Afindoe@uvs.edu

ACCREDITATION AND QUALITY ASSURANCE

The Anton de Kom University of Suriname aims at offering innovative education at high, internationally competitive standards. This MSc program will be evaluated to ensure and maintain its quality:

- The program will be formally accredited following an internationally recognized procedure to be coordinated by NOVA (Ministry of Education) by the end of 2026
- Each year, the program management conducts a review to assess whether the objectives have been achieved. External program supervisors will monitor examinations, assessments, and suitability of teaching infrastructure.
- Courses in the program are evaluated regularly by participating students, through evaluation forms available on Moodle through the ‘Vakevaluatie course’, following a schedule determined by the Faculty of Technology.

ADMISSION, REGISTRATION AND FEES

ADMISSION REQUIREMENTS

To qualify for admission, the student should have an appropriate BSc diploma in geosciences or related field:

- Applicants with a BSc degree in Geosciences from the Anton de Kom University are eligible for direct enrollment. Work experience is not mandatory but considered an asset.
- Applicants with a BSc in Mining & Resource Engineering from IBW, may be admitted following a selection interview, provided they have at least three years of relevant industry experience.
- International candidates should submit their application for admission using the application form. Their academic backgrounds will be evaluated individually.

FEES

Tuition Fees (Local - Suriname)	US\$ 2000,- per annum
Admission Fee	SRD 4200,- per annum
Tuition Fees (International)	US\$ 3000,- per annum
Individual Module (certificate)	US\$ 400,-

ADDITIONAL COSTS

The program offers two field courses. Students are expected to possess a valid passport and cover their travel expenses to the field areas (including flights, local transportation, and accommodation). The Marowijne Greenstone Belt field course will likely take place in eastern Suriname and may extend into French Guiana along the St. Laurent du Maroni – Apatou road. The estimated travel costs are approximately US\$ 500, which includes transportation, visa application, and insurance.

The international field trip will take place in Minas Gerais, Brazil. Estimated travel costs are approximately US\$ 1,500 to US\$ 2,000, covering flights and insurance. Accommodation and subsistence for both courses will be covered by the program.

Suitable field gear is required for the field courses. This includes walking shoes/boots, a field notebook, writing and coloring pencils, a geological hammer, a compass and a hand lens (loupe).

COURSE DESCRIPTIONS

COMMON COURSES

Note: The course descriptions provided below are subject to change and are therefore intended solely to provide an overview of the basic structure and information of the courses.

ACADEMIC SKILLS

Course Code:	GW700
Credits [ECTS]:	3
Duration (weeks):	3
Period:	15-Sep-2025 – 04-Oct-2025
Lecturer:	Dr. Gerda Visser-Wijnveen
Counterpart Lecturer:	Ginny Bijnaar, PhD Candidate
Prerequisite knowledge:	No pre-requisites
Relationship to other courses within the program:	This course assists the student in maximizing his/her study success. The student is prepared to become a successful learner. In this regard emphasis is placed on critical thinking, reading, writing and listening skills and other skills which aid in academic development and learning.
Brief Description:	This course offers students a solid foundation in academic skills that are essential for successfully completing the Master's program in Mineral Geosciences and Mining. The course focuses on formulating research questions, dealing responsibly with scientific information, academic writing and presentation. In addition, ethical issues are discussed using cases and current themes such as the use of AI in research.
Course Objectives and Learning Outcome:	<p>In general, the aim of this course is to bring knowledge to the students that can effectively be applied in the start, continuation, and finish of the program.</p> <p>By the end of the module, the student will be able to:</p> <ul style="list-style-type: none"> • Demonstrate academic integrity and responsible research conduct • Design and plan a research project <ul style="list-style-type: none"> ○ Formulate a problem statement/research question/hypothesis which is literature-embedded, scientifically relevant, precise and methodologically functional; • Search, select, and critically evaluate relevant academic peer-reviewed literature to identify the research gap and synthesize relevant findings • Apply <i>advanced</i> academic writing skills, including the use of APA reference style, to produce coherent and structured texts • Communicate research findings effectively through a short presentation based on a literature review within the geosciences domain. • Engage in scholarly discussion by actively listening, formulating questions and providing constructive feedback to peers. • Demonstrate <i>autonomy</i> in learning and research
Teaching Method:	Interactive lectures with short assignments, Practical (including searching and analyzing literature), Group discussions (including research ethics), Self-study and homework assignments, Poster, and PowerPoint presentation
Assessment:	<ul style="list-style-type: none"> • Homework assignments (including bibliography, ethical reflection, problem analysis, academic writing) • Poster and PowerPoint presentation of own work (individually and in pairs)

	<ul style="list-style-type: none"> Active participation in interactive sessions and peer review
Final Mark:	N/A
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> Gaast van der, K., Koenders, L, Post, G. (2015). Academische vaardigheden voor interdisciplinaire studies. Amsterdam, Nederland: Amsterdam University Press Van Cleemput, O. and Saso, L. (2017). Manual on Scientific Communication for Postgraduate Students and Young Researchers in Technical, Natural and Life Sciences. DOI 10.5772/intechopen.69870. ISBN: 978-953-51-3442-8 (download as pdf)

GREENSTONES THROUGH TIME AND METALLOGENY

Course Code:	GW705
Credits [ECTS]:	7
Duration (weeks):	7
Period:	02 – 09 Sep 2025, 6 – 10 Oct 2025, 10 – 21 Nov 2025
Lecturer:	Dr. Marc Bardoux
Counterpart Lecturer:	Nicole Kioe-A-Sen, PhD Candidate
Prerequisite knowledge:	Basic knowledge of igneous/metamorphic petrology, structural geology, mineral systems, and early Earth evolution.
Relationship to other courses within the program:	This course builds on prior learning in structural geology, petrology, and tectonics. It supports thesis work related to Precambrian terrains and mineral exploration, and complements field-based modules
Brief Description:	<p>This course provides an in-depth exploration of greenstone belts across the Archean and Rhyacian—their tectonic settings, deformational histories, metamorphic overprints, and associated metallogenic processes.</p> <p>During the course global examples will be compared across the globe from Australia, Canada, Africa, the West African Craton, the Guiana Shield, and Fennoscandia. It examines the spatial and temporal distribution of mineral systems—particularly gold, nickel, and base metals—and the geological conditions that controlled their formation.</p>
Course Objectives and Learning Outcome:	<p>By the end of the module, the student will be able to:</p> <ul style="list-style-type: none"> Explain the tectonic evolution and deformational styles of greenstone belts from the Archean and Paleoproterozoic. Distinguish the metallogenic characteristics of greenstones in different geodynamic regimes. Analyze case studies of world-class greenstone-hosted gold and base metal deposits. Critically review scientific literature and communicate key geological concepts effectively.
Teaching Method:	<ul style="list-style-type: none"> Lectures with interactive discussions for core content delivery. Case-based learning using global greenstone belt examples. Student-led literature reviews to foster critical thinking and communication skills. Hands-on data interpretation sessions using geophysical and geochemical datasets. Field trip to examine greenstone lithologies, structures, and alteration styles in situ. Group assignments and presentations to promote collaboration and application.

Assessment:	Group presentation of selected scientific paper, field trip, written exam
Final Mark:	Group presentation 20% + Field trip 20% + Written Exam 50%
Textbooks and/or Reference Books:	

FIELDWORK MAROWIJNE GREENSTONE BELT

Course Code:	GW804
Credits [ECTS]:	3
Duration (weeks):	3
Period:	04 – 14 Dec, 2025
Lecturer:	Prof. Olivier Vanderhaeghe
Counterpart Lecturer:	Fydji Sastrohardjo, PhD Candidate
Prerequisite knowledge:	Successful completion of undergraduate field methods and basic structural geology courses. Prior experience with GIS and geologic mapping software is an advantage.
Relationship to other courses within the program:	This course is a core component of the MSc Geosciences curriculum, designed to bridge theoretical knowledge with field-based application. The field trip supports the development of practical competencies that are essential for advanced research projects, including thesis work.
Brief Description:	Three weeks expedition, Cross-section of the greenstone belt along the Marowijne and Tapanahony Rivers, each student gets a specific outcrop to study in detail for her/his exam.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>Getting a comprehensive view of the geology of Suriname, with special focus on the Marowijne Greenstone Belt. The objective is to widen the student's field experience in ore geology. Through visiting important mineral deposits in different tectonic setting, and fieldwork practice, students will learn the regional ore geology, and related mineral exploration in Suriname.</p> <p>By the end of the module, the student will be able to demonstrate:</p> <ul style="list-style-type: none"> • Apply field techniques to map and analyze complex Precambrian terranes • Distinguish and correlate key lithostratigraphic units of the Marowijne Greenstone Belt • Synthesize structural and stratigraphic data into coherent geological interpretations • Communicate geological findings effectively through maps and technical reporting
Teaching Method:	Pre- and after-field briefings and field instructions
Assessment:	Mapping projects with associated cross sections and reports
Final Mark:	Field report (50%, Field notebook 25%, Maps and Cross Sections 25%)
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Wong, Theo, Salomon Kroonenberg & Pieter Augustinus, 2017. Geologie en landschap van Suriname. LM Publishers, Volendam, 178 pp

	<ul style="list-style-type: none"> • Kroonenberg, S.B., De Roever, E.W.F., Fraga, L.M., Reis, N.J., Faraco, M.T., Cordani, U.G., Lafon, J.-M & Wong, Th. E., 2016. Paleoproterozoic evolution of the Guiana Shield in Suriname – a revised model. Netherlands Journal of Geosciences- Geologie en Mijnbouw 95:491-522 • Proceedings SAXI-XI Inter Guiana Geological Conference, Paramaribo, Suriname. Mededelingen Geologisch Mijnbouwkundige Dienst Suriname 29
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MINERAL SYSTEMS AND METALLOGENY

Course Code:	GW704
Credits [ECTS]:	7
Duration (weeks):	7
Period:	04 Mei 2026 – 17 Mei 2026
Lecturer:	Prof. Steffen Hagemann and prof. Rosalina Da Silva
Counterpart Lecturer:	Nicole Kioe-A-Sen, PhD Candidate
Prerequisite knowledge:	Igneous, sedimentary, and metamorphic petrography and structural geology
Relationship to other courses within the program:	This course serves as a basis for Fieldwork Brazil and Greenstones through time and metallogenesis. It complements Petrology and mineralogy, Magmatic and Hydrothermal Processes, Structural Geology and Tectonics
Brief Description:	This course focuses on understanding the genesis of ore deposits, with emphasis on ore forming processes (mainly hydrothermal), classification using mineral system criteria.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>Provide a mineral system analysis of various ore deposit types including their structural, hydrothermal alteration/mineralization and fluid chemistry control in different litho-tectonic settings.</p> <p>By the end of the module, the student will be able to:</p> <ul style="list-style-type: none"> • Explain the fundamental ore-forming processes, with an emphasis on hydrothermal systems, and classify ore deposits using the mineral systems approach. • Describe and interpret the geological, structural, geochemical, and mineralogical characteristics of key ore deposit types. • Apply the mineral systems framework to analyze the genesis of ore deposits in different litho-tectonic settings. • Evaluate the role of fluid chemistry, host rock characteristics, structural controls, and alteration patterns in ore formation. • Integrate knowledge from related disciplines—such as petrology, structural geology, and geochemistry—to build conceptual models of ore-forming environments.
Teaching Method:	Class lectures and practical
Assessment:	The examination includes an individual presentation, submission of laboratory exercises (brief essay) and a written exam
Final Mark:	Oral Presentation 10% + Lab Assignment 45% + Written Exam 45%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Ridley, J. 2013. Ore Deposit Geology, Colorado State University, 398 p. • Robb, L. 2004. Introduction to Ore-forming Processes, Blackwell Science Ltd, Oxford, 384 p. • Reprints of scientific papers (Economic Geology, Ore Geology Reviews, Mineralium Deposita) related to the course content handed out during the lectures.

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SUSTAINABLE DEVELOPMENT OF MINERAL RESOURCES

Course Code:	GW1007
Credits [ECTS]:	5
Duration (weeks):	5
Period:	18 Jan 2027 – 20 Feb 2027
Lecturer:	prof. Joerg Benndorf
Counterpart Lecturer:	
Prerequisite knowledge:	Basic geoscientific knowledge
Relationship to other courses within the program:	This course builds upon the economics of mineral resources and mining and feeds into professional practice in geoscience
Brief Description:	The principles of sustainable development aim to combine the social, economic, and environmental impact into one integrated approach, whereby the effect of current activities or decisions should not have an effect on future generations.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> • Provide insight into the principles of sustainable development applied within the mineral resources industry. <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • A basic understanding of the various aspects of sustainable development, applied within the mineral resources industry. • The ability to understand the integrated approach of social, economic, and environmental aspects in past and future case studies. • A basic knowledge of regulations and best practices.
Teaching Method:	Combination of lectures (global emphasis)
Method of Examination:	Project evaluation and Project Work
Final Mark:	Project evaluation (25%) + Project Work (75%)
Textbooks and/or Reference Books:	Mining's contribution to sustainable development – an overview. June 2012. International Council on Mining & Metals

MINERAL RESERVES ASSESSMENT AND GEOSTATISTICS

Course Code:	GW1008
Credits [ECTS]:	7
Duration (weeks):	7
Period:	08 Mar 2027 – 17 Apr 2027
Lecturer: Counterpart Lecturer:	Prof. Vincent van Hinsberg
Prerequisite knowledge:	Basic knowledge for bachelor students in geology of Chemistry, Physics, Mathematics, and computer sciences
Relationship to other courses within the program:	
Brief Description:	<p>The Earth Sciences are predominantly a quantitative science, and the ability to properly analyse and interpret data is therefore a key requirement for Earth Science graduates. In this course we will explore how to analyse data and what statistical tools are available and appropriate to help in this analysis. We start with simple description of variables and how to compare data sets, then move to correlations between variables and regression modelling, before looking at more complex multi-dimensional statistical tools such as clustering, discrimination functions and principal component analysis. Finally, visualization of spatial data and interpolation techniques such as kriging will be addressed.</p> <p>This course is tuned specifically to “geo” data, which include chemical data on rocks, soils, and waters; size distribution of particles, minerals and fossils; and orientation of rocks in the field. This is because such data come with unique challenges that require dedicated statistical techniques. For example, we can unfortunately not run experiments on geological processes such as plate tectonics and will therefore always be limited by a small sample set.</p>
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> • A thorough understanding of basic statistics applicable for the exploration geochemist. • Working knowledge of multivariate statistics for the improvement of the interpretation of exploration data. • An introduction into mapping algorithms, semi-variograms and kriging • Training in computational mapping techniques of geochemical data. <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • The correct interpretation of data with univariate and bivariate statistics • The application of various techniques such as discriminant function analysis, cluster analysis, multiple regression, factor analysis • A good basic knowledge of geostatistics • An adequate working knowledge of statistical and geostatistical software.
Teaching Method:	Lectures, Practicals
Method of Examination:	Written Exam, Data Analysis Project
Final Mark:	= Written Exam (60%), Data Analysis Project (40%)

Textbooks and/or Reference Books:	<p>The book that we will use for the course is “An introduction to geological data analysis” by Swan and Sandilands (Blackwell publishing, ISBN 0632032243). The main advantage of this book over standard statistics textbooks is that it is tuned specifically to statistical techniques relevant to the Earth Sciences. Unfortunately, the book is no longer in print, but second-hand copies are readily available online. The following chapters should be studied;</p> <p>chapter 1: completely chapter 2: 2.1, 2.2, 2.4 (except 2.4.5.3/4), 2.5, 2.6 up to 2.6.2.3 chapter 3: up to 3.3.2 chapter 4: completely chapter 7: 7.1 & 7.2 (general concepts only), 7.3, 7.4.3 chapter 8; 8.1.1, 8.1.2, 8.3, 8.4, 8.5, 8.6 (general concepts only)</p>
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ECONOMICS OF MINERAL DEPOSITS AND MINING

Course Code:	GW1009
Credits [ECTS]:	6
Duration (weeks):	6
Period:	03 Mei 2027 – 12 Jun 2027
Lecturer:	Dr. Joerg Benndorf
Counterpart Lecturer:	
Prerequisite knowledge:	Familiarity with Exploration Techniques, Structural Geology, Basic Mining economics, basic Mining Engineering
Relationship to other courses within the program:	Provides the technical basis for estimating and classifying mineral resources/reserves.
Brief Description:	This course focuses on the economic aspect of the mineral reserves and resources, as well as the economic link between mineral reserves and mining. The aim of this course is to familiarize the student with the practical side from defining mineral reserves to mine operations
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> • Give an overview of the path from an exploration project to a mine operation. • Give an overview of the definition and classification of the mineral reserves and resources. • Discuss the technical aspect of mining, milling and the impact of the type of ore deposit upon reserve and resource classification and the economic performance of a mine. • Discuss all economic factors that influence the reserves and resources calculations to acquire the basic knowledge about the specific software used in the mining industry for exploration, ore body modelling, reserves calculation and classification (Gemcom, Surpac, Whittlely). <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • provide an overview of the path from an exploration project to a mine operation • explain the definition and classification of the mineral reserves and resources • discuss the technical aspect of mining, milling and the impact of the type of ore deposit upon reserve and resource classification and the economic performance of a mine • define cash flows for different decision options • apply economic evaluation techniques for best decision making

	<ul style="list-style-type: none"> • identify key economic risks in a mining project and perform a sensitivity analysis • explain financing strategies and the value of flexibility in mining
Teaching Method:	Lectures, Seminars, Work Placement, and Independent Study
Method of Examination:	Written Examination, Assignments
Final Mark:	Formal Examination (40%) + Assignments (60%)
Textbooks and/or Reference Books:	Wellmer, F., Dalheimer, M., Wagner, M. (2008), Economic Evaluations in Exploration. Second Edition. Springer

PROFESSIONAL PRACTICE IN GEOSCIENCE

Course Code:	GW1102
Credits [ECTS]:	3
Duration (weeks):	3
Period:	02 Aug 2027 – 28 Aug 2027
Lecturer:	Dr. Eric Dominic Forson
Counterpart Lecturer:	
Prerequisite knowledge:	None
Relationship to other courses within the program:	
Brief Description:	Course content includes preparation of geological reports, project proposals and oral presentations, mining/minerals and petroleum laws and regulation, corporate structure and management, exploration management and quality assurance of geological data, professional ethics, organizations and societies, professional development and training, and best practice guidelines in the geosciences. In addition, students will learn how to search and apply for job, and how to perform well at interviews. Policies, regulations, and laws that govern mining licenses will be discussed.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>to improve the writing and communication skills of students and prepare them for a career in the geoscience profession. Most senior management activities are carried out through committees, etc. and as such small group discussions and communications will be discussed. Students will make presentations on how to improve their writing and communication skills and prepare them for a career in the geoscience profession.</p> <p>At the end of this course, students will have a better understanding of how Ghana's public services function, various policy development processes and how implementation strategies are developed, and programmes/projects are monitored and evaluated. Similarly, students will understand how laws and regulations are developed and have knowledge in the various laws in the geoscience areas in public services such as in mining and petroleum resources and the implications for the prudent management of various corporate and public systems in the country.</p> <p>After completing the course, the student is able to:</p> <ul style="list-style-type: none"> • Evaluate the development of one's own expertise in the task of a geologist / engineer

Teaching Method:	This course will be delivered in the traditional lecture format and individual/group presentations. There will be occasional lectures to be delivered by professionals from industry.
Method of Examination:	Students will make presentations on how to improve their writing and communication skills and prepare them for a career in the geoscience profession.
Final Mark:	
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Andrews, G.C. (2008). <i>Canadian professional engineering and geoscience: Practice and Ethics</i>. Canada: Nelson College Indigenous • Buchanan, R., Adkins-Heljeson, M. & Bates, R. (2011). <i>Geowriting</i>. Virginia: American Geological Institute. • Hofmann, A.H. (2009). <i>Scientific Writing and Communication: Papers, Proposals, and Presentations</i>. USA: Oxford University Press. • Morales, G. (2012). <i>How to land a top-paying geoscience professors job</i>. USA: Tebbo (April 8, 2012) • Rosen, S. & Paul, C. (1997). <i>Career renewal: Tools for scientists and technical professionals</i>. London: Academic Press. • Samuels, B.M. & Sanders, D. (2010). <i>Practical law of architecture, engineering, and geoscience</i>. Canada: Prentice-Hall • Wyss, M. & Peppoloni, S. (2015). <i>Geoethics. Ethical Challenges and Case Studies in Earth Sciences</i>. Amsterdam, The Netherlands: Elsevier B.V.

PROJECT PROPOSAL

Course Code:	GW1100
Credits [ECTS]:	4
Duration (weeks):	4
Period:	04 Oct 2027 – 24 Oct 2027
Lecturer:	Team effort
Counterpart Lecturer:	
Prerequisite knowledge:	Academic skills, relevant subject-specific courses based on specialization
Relationship to other courses within the program:	This module encourages participants to think critically about a chosen research topic. The module is designed to help participants prepare for their independent research project by developing their ability to plan research
Brief Description:	This course prepares students for the independent research phase of the MSc program by guiding them through the process of designing a scientifically sound and feasible research proposal. Emphasis is placed on identifying a relevant and original research question within the field of mineral geosciences or mining, conducting a focused literature review, selecting appropriate research methodologies, and developing a structured project plan.
Course Objectives and Learning Outcome:	<p>Participants are expected to undertake a thorough review of relevant literature and present clearly defined research hypotheses or objectives based on this review.</p> <p>By the end of the course, students will have developed a comprehensive research proposal that will form the foundation for their MSc thesis project.</p> <p>Upon successful completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Formulate clear and focused research questions or hypotheses. 2. Conduct a critical and structured literature review relevant to the proposed topic.

	<ol style="list-style-type: none"> 3. Design a research methodology appropriate to the research problem and available resources. 4. Identify ethical, logistical, and scientific considerations in field and analytical research. 5. Present a written and oral research proposal that meets academic and professional standards.
Teaching Method:	Instructions
Method of Examination:	<p>For assessment, participants will produce and submit a 3500-word proposal (written report, 80%), an infographic (15%) and a short reflection (5%) on what they learned and what was challenging.</p> <p>The written proposal is aimed at a scientific but non-specialist audience, so technical content should be clearly explained. The infographic should be aimed at a public audience and pitches the proposed research project using straightforward language and effective graphics.</p>
Final Mark:	Research proposal 80% + Pitch 15% + Reflection report 5%
Textbooks and/or Reference Books:	Tailored to research project

FIELDWORK BRAZIL

Course Code:	GW1103
Credits [ECTS]:	3
Duration (weeks):	3
Period:	04 Oct 2027 – 24 Oct 2027
Lecturer:	Prof. Rosalina Da Silva
Counterpart Lecturer:	Nicole Kioe-A-Sen, PhD Candidate / Fydji Sastrohardjo, PhD Candidate
Prerequisite knowledge:	Core coursework in Mineral Geology or Mine Engineering, including Structural Geology, Mineral Systems & Metallogeny
Relationship to other courses within the program:	
Brief Description:	During this field course students will do an interactive site visit in the mining environment of Minas Gerais in Brazil. The course focuses on integrating geoscientific observations with mine planning and resource management, and on recognizing how exploration data, geological models, and engineering decisions intersect in a real-world context.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • Relate geological observations to mineral system models and mine-scale planning
Teaching Method:	Pre-field briefings and field instructions
Method of Examination:	Mapping projects with associated cross sections and reports
Final Mark:	Field report (50%, Field notebook 25%, Maps and Cross Sections 25%)
Textbooks and/or Reference Books:	N/A

MASTER'S THESIS

Course Code:	GW1200
Credits [ECTS]:	30
Duration (weeks):	30
Period:	24 Oct 2027 – Jul 2028
Lecturer: Counterpart Lecturer:	Various
Prerequisite knowledge:	To start with MSc research, a student must have completed all course work and exams. In consultation with the program coordinator the student can start if he/she has only 1 course yet to complete
Relationship to other courses within the program:	
Brief Description:	The MSc research represents the culmination of the Master's program in Mineral Geosciences and Mining. The MSc thesis is an individual research project that is accomplished by the student. The topic of interest should fit within the Mineral Geosciences and Mining program. It can be theoretical or practical, could include fieldwork and/or lab work and/or computer-based simulation/modelling
Course Objectives and Learning Outcome:	<p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • Skills to pursue independent research • Advanced knowledge in the field of Mineral Geology or Mine Engineering specialization field • Ability to critically evaluate, synthesize and generate new ideas or interpretations • Ability to write reports at publishable level
Teaching Method:	
Method of Examination:	
Final Mark:	
Textbooks and/or Reference Books:	N/A

MINERAL GEOLOGY COURSES

ADVANCED MINERALOGY AND PETROLOGY

Course Code:	GW805
Credits [ECTS]:	7
Duration (weeks):	7
Period:	05 Jan 2026 – 21 Feb 2026
Lecturer:	Dr. Pieter Vroon
Counterpart Lecturer:	
Prerequisite knowledge:	Basic knowledge in petrology, mineralogy, and geochemistry at BSc level
Relationship to other courses within the program:	
Brief Description:	This course provides students with a comprehensive understanding of magmatic and metamorphic rocks through three core components: mineralogical and textural analysis; geochemical investigation of major and trace elements; and interpretation of rock-forming processes in relation to tectonic environments.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> • Provide an overview of the fundamentals of igneous and metamorphic rock formation. • Train students in interpreting the history of crystalline rocks based on mineralogical, chemical, and textural evidence. • Demonstrate the links between petrogenetic processes, minerals, and ore formation. <p>By the end of the module, the student will be able to:</p> <ul style="list-style-type: none"> • Explain the principles of (1) magma formation and differentiation, (2) and metamorphic processes and reactions in a geological context. • Understand data obtained from common crystalline rocks and minerals in terms of formation processes and conditions. • Interpret rock and mineral chemistry for petrogenetic reconstructions in a given geological setting. • Comprehend the basic theory of element distribution and apply it in simple quantitative models. • Read scientific literature in this field.
Teaching Method:	On-campus and online Lectures, laboratory sessions and independent essay study (including preparation for assessments).
Method of Examination:	Written examination, essay, coursework, and practical (microscopy) reports
Final Mark:	= Written Examination 45(%) + Practical reports (10%) + Course questions(10%)+Individual Essay (35%)
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Myron G. Best (2002) - Igneous and metamorphic petrology; 2nd edition, Wiley-Blackwell

	<ul style="list-style-type: none"> Philpotts, A., & Ague, J. (2009). Principles of Igneous and Metamorphic Petrology (2nd ed.). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511813429 Course Handouts
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MAGMATIC HYDROTHERMAL PROCESSES AND ORE FORMATION

Course Code:	GW807
Credits [ECTS]:	7
Duration (weeks):	7
Period:	02 Mar 2026 – 17 Mei 2026
Lecturer:	Dr. Manfred Van Bergen
Counterpart Lecturer:	Nicole Kioe-A-Sen, MSc
Prerequisite knowledge:	Basic knowledge in petrology, mineralogy, and geochemistry at BSc level
Relationship to other courses within the program:	
Brief Description:	This course treats the fundamentals of pathways and processes that accompany ore formation in magmatic-hydrothermal environments and introduces research tools to recognize mechanisms and conditions of past alteration events in rocks and minerals.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> Provide an introduction of the fundamentals of hydrothermal processes associated with magmatic systems. Explain the use of mineral assemblages and rock compositions as a record of past hydrothermal processes. Train students in interpreting the alteration history of crystalline rocks using quantitative models. Demonstrate the links between magmatic-hydrothermal processes and ore formation. <p>By the end of the module, the student will be able to:</p> <ul style="list-style-type: none"> Explain the key components of magmatic-hydrothermal systems, discuss the principal operating processes, and provide typical examples for the most common geological settings. Understand how altered rocks acquired their properties and how to interpret mineralogical and chemical information for the reconstruction of alteration processes. Comprehend element re-distribution during alteration processes and ore formation, the role of volatiles as transport medium and apply simple quantitative models. Read scientific literature in this field
Teaching Method:	Lectures, laboratory sessions and independent study (including preparation for assessments).
Method of Examination:	Written examination, essay/coursework
Final Mark:	= Formal Examination (75%) + Essay(s)/ Coursework and exercises (25%)

Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Pirajno, Franco (2009) - Hydrothermal Processes and Mineral Systems, Springer • Course handouts
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STRUCTURAL GEOLOGY & TECTONICS

Course Code:	GW706
Credits [ECTS]:	7
Duration (weeks):	7
Period:	14 Jul 2025 – 30 Aug 2025
Lecturer:	Prof. Olivier Vanderhaeghe and dr. Brice Lacroix
Counterpart Lecturer:	Fydji Sastrohardjo, PhD Candidate
Prerequisite knowledge:	Students are generally expected to have BSc level background knowledge in Physical Geology, Mineralogy and Petrology, Basic Structural Geology, General Math & Physics.
Relationship to other courses within the program:	This course complements the Metallogenesis and Mineral Exploration courses. It supports advanced field mapping and tectonic interpretation skills.
Brief Description:	Beginning with an overview of fundamental concepts such as stress, strain, and rock rheology, the course systematically explores structures formed under discontinuous (brittle), semi-continuous, and continuous (ductile) deformation regimes. Through a combination of theoretical lectures and practical assignments, students gain experience in interpreting fault kinematics, analyzing fold geometries, and understanding deformation histories through microstructural and macrostructural data.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> • Give an overview of the structural concepts and processes that are required for meaningful analysis of deformed crustal rocks in light of exploration for natural resources. • Train students to become skilled interpreters of deformation structures at a range of scales. <p>At the end of the module, students will be able to:</p> <ul style="list-style-type: none"> • Differentiate and describe structural features associated with brittle, ductile, and transitional deformation regimes. • Apply stress and strain concepts to real-world geologic structures. • Use stereographic projections for structural data interpretation and tectonic stress analysis. • Identify and interpret microstructural features related to deformation mechanisms. • Evaluate the structural controls on ore formation in tectonic settings.
Teaching Method:	<p>The course is taught through a combination of:</p> <ul style="list-style-type: none"> • Lectures to introduce theoretical concepts and frameworks. • Home assignments related to each subject, including the use of stereonet for structural interpretation.

	<ul style="list-style-type: none"> Case study discussions to integrate structural geology with tectonic and mineralization processes.
Method of Examination:	Home Assignments, Written Exam
Final Mark:	= Written (30%) + Home assignments (70%)
Textbooks and/or Reference Books:	Ramsay (1983), The Techniques of Modern Structural Geology. Volume 1: Strain Analysis Ramsay (1983), The techniques of Modern Structural Geology. Volume 2: Fold and Fractures Fossen (2016), Structural Geology. Second Edition

GEOPHYSICAL EXPLORATION OF MINERAL RESOURCES

Course Code:	GW912
Credits [ECTS]:	5
Duration (weeks):	5
Period:	01 Jun 2026 – 12 Jul 2026
Lecturer:	Prof. Dr. William Roggenthen
Counterpart Lecturer:	Manolito Indiaan, MSc
Prerequisite knowledge:	Familiarity with basics of geologic structures, physics, general computer competency
Relationship to other courses within the program:	
Brief Description:	The course covers the principles of operation of the more commonly used instrumentation for potential field measurements for mineral exploration, such as gravity, magnetics, and electromagnetic methods. The results of surveys using these methods are evaluated using common interpretation techniques in order to infer subsurface geologic structures and rock types. Performance of computer modelling interpretations for gravity and magnetics is a major portion of the instruction.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> Give an overview of the principles of operation of typical instrumentation used for potential field surveying for mineral resources. Introduce students to different methods of interpretation of the results of potential field surveys. Introduce students to digital modeling of geophysical data and apply the results to existing geological situations. <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> An understanding of the physical principles of instrumentation measuring the Earth's gravity field. An understanding of the physical principles of instrumentation measuring the Earth's magnetic field. An ability to interpret data from gravity surveys to infer subsurface geologic structures and rock types. An ability to interpret data from magnetic surveys to infer subsurface geologic structures and rock types. An ability to use gravity and magnetic data in digital modeling to infer subsurface geologic structure and rock types.
Teaching Method:	Lectures, Exercises
Method of Examination:	Formal Examination, Computer Exercises

Final Mark:	= Formal Examination (60%) + Computer Exercises (40%)
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> H. Robert Burger, Anne F. Sheehan, Craig H. Jones, 2006, Introduction to Applied Geophysics: Exploring the Shallow Subsurface. ISBN-10: 0393926370 Course notes, computer exercises + handouts

GEOCHEMICAL EXPLORATION METHODS AND ANALYTICAL TECHNIQUES

Course Code:	GW910
Credits [ECTS]:	5
Duration (weeks):	5
Period:	27 Jul 2026 – 06 Sep 2026
Lecturer:	Prof. Paul Alexandre
Counterpart Lecturer:	Fydji Sastrohardjo, PhD Candidate
Prerequisite knowledge:	Basic knowledge for bachelor students in geology of chemistry, physics, uni- & multivariate statistics and computer sciences
Relationship to other courses within the program:	
Brief Description:	Through exogenic and endogenic processes indications of ore deposits are greatly enlarged in relation to the economic size of the deposit. Modern geochemical and analytical techniques have the capability to pick up these indications in complex geochemical landscapes. In this course students are made familiar with the setting of mineral deposits and the techniques needed to identify them in sometimes concealed environment.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <ul style="list-style-type: none"> give a broad introduction in geochemical mapping with the emphasis on geochemical exploration. Subjects that are treated are geochemical mapping, sampling schemes and strategies, preparation of rock, soil and water samples, brief introductions in analytical techniques such as spectrometry, atomic absorption spectrometry, inductively coupled emission spectrometry, inductively coupled mass spectrometry, x-ray fluorescence, handheld x-ray fluorescence, quality control of sampling and analytical procedures, and the geochemistry related to the rock, soil and water phases. <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> a thorough knowledge of the field of geochemical exploration. This entails the knowledge of the geochemical behavior of the chemical elements in the exogenic and endogenic environment, rock, soil, sediment, and water sampling techniques, the “state of the art” analytical chemistry required in the analysis of the collected samples within geochemical surveys as well as the quality control the analysis
Teaching Method:	12 Lectures of 1 to 1,5 hour 50% 18 hrs Problem solving Practical Exercises, example classes 40% 16 hrs. Laboratory Lecture Sessions 10% 2 hrs.
Method of Examination:	Written examination and course work
Final Mark:	Written Exam (70%) + Course work (30%)

Textbooks and/or Reference Books:	Moon, C.J. et al. 2006. Introduction to Mineral Exploration, Second Edition. Blackwell Publ. pp 481
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ADVANCED METAMORPHIC PETROLOGY

Course Code:	GW914
Credits [ECTS]:	5
Duration (weeks):	5
Period:	05 Oct 2026 – 07 Nov 2026
Lecturer:	Dr. Leo Kriegsman
Counterpart Lecturer:	Stacey Amattaram, PhD Candidate
Prerequisite knowledge:	Petrology and Mineralogy, Magmatic Hydrothermal Processes and Ore Formation
Relationship to other courses within the program:	
Brief Description:	<p>This advanced course builds on foundational petrology to explore the mineralogical, textural, and geochemical evolution of rocks subjected to metamorphism. Emphasis is placed on understanding pressure-temperature-time (P-T-t) paths, phase equilibria, and the interpretation of metamorphic textures in the context of tectonic settings.</p> <p>Students will develop the skills to analyze and interpret metamorphic mineral assemblages using petrographic, thermodynamic, and geochemical methods. The course includes practical components such as thin section analysis, pseudo section construction, and case study evaluations of metamorphic terrains relevant to the formation of mineral deposits.</p>
Course Objectives and Learning Outcome:	<p>Upon successful completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Identify and classify metamorphic rocks and their mineral assemblages using petrographic techniques. • Construct and interpret P-T-t paths for regional and contact metamorphic settings. • Apply phase diagram modelling (e.g., pseudo sections) to assess metamorphic conditions. • Evaluate the role of fluid-rock interaction, deformation, and metamorphism in ore formation. • Integrate field, petrographic, and geochemical data to interpret metamorphic histories. • Communicate findings through technical reports and oral presentations.
Teaching Method:	Lectures, Lab work (microscopy)
Method of Examination:	Technical reports, oral presentation, and written exam
Final Mark:	Technical report 30% Presentation 30% Written Exam 40%

Textbooks and/or Reference Books:	
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STRUCTURAL GEOPHYSICS

Course Code:	GW1005
Credits [ECTS]:	5
Duration (weeks):	5
Period:	16 Nov 2026 – 19 Dec 2026
Lecturer:	Prof. Mark Jessell
Counterpart Lecturer:	Fydji Sastrohardjo, PhD Candidate
Prerequisite knowledge:	Geophysical Exploration of Mineral Resources
Relationship to other courses within the program:	This course is an integration of the previous courses and combines geological knowledge on structural geology, tectonics and petrology obtained in the first year of the program with exploration methods obtained in the second year. It enables students to perform data interpretation with the use of (3D) computer software.
Brief Description:	Many regions in the world now are covered at a high-resolution by airborne geophysical data sets, including magnetic, electromagnetic, digital terrain models and radiometric surveys. When combined with multi-spectral satellite data, and of course the available geological observations, these geophysical data provide key constraints on our geological interpretation, in ancient terrains. This course will provide an introduction to modern laboratory-based techniques applied to the regional geophysical data of northeastern South America
Course Objectives and Learning Outcome:	<p>This module aims to: learn the theoretical basis for geological interpretation of regional geophysical data. - Acquire interpretation skills.</p> <p>At the end of the module, a candidate will be able to demonstrate:</p> <ul style="list-style-type: none"> • fundamental interpretation techniques needed to use very high-resolution data sets and those who are faced with the problem. • integration of geological and geophysical data.
Teaching Method:	Lectures, Case studies, Practical Exercises
Method of Examination:	Case study, Exercise
Final Mark:	Case study 50%, Exercises 50%
Textbooks and/or Reference Books:	

MINE ENGINEERING COURSES

FUNDAMENTALS IN MINE ENGINEERING

Course Code:	GW803
Credits [ECTS]:	5
Duration (weeks):	5
Period:	14 Jul 2025 – 30 Aug 2025
Lecturer:	Dr. Festus Sadaari
Counterpart Lecturer:	Gracia Pultoo, MSc
Prerequisite knowledge:	Introductory to mining
Relationship to other courses within the program:	
Brief Description:	This course provides a foundational understanding of mining engineering, covering the principles, practices, and technologies involved in the extraction of mineral resources. Students will explore the lifecycle of mining operations.
Course Objectives and Learning Outcome:	<p>The aim of this course is to explain the fundamental concepts of mining engineering and its role in resource extraction, and to identify different mining methods (surface and underground) and their applications.</p> <p>Upon successful completion of this course, students will:</p> <ol style="list-style-type: none"> 1. Demonstrate knowledge of key mining terminologies and processes. 2. Compare and contrast various mining techniques based on geological and economic factors. 3. Apply basic principles of mine planning and design. 4. Interpret geological data and its relevance to mining operations.
Teaching Method:	Lectures and Assignments
Method of Examination:	Written Exam and Assignments
Final Mark:	Written Exam 60% Assignments 40%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Hartman, H. L., & Mutmansky, J. M. (2002). <i>Introductory mining engineering</i> (2nd ed.). Wiley. • Darling, P. (Ed.). (2011). <i>SME mining engineering handbook</i> (3rd ed.). Society for Mining, Metallurgy & Exploration. • Wills, B. A., & Finch, J. (2015). <i>Wills' mineral processing technology</i> (8th ed.). Butterworth-Heinemann. • Brady, B. H. G., & Brown, E. T. (2004). <i>Rock mechanics for underground mining</i> (3rd ed.). Springer. • United Nations Environment Programme. (2019). <i>Mineral resource governance in the 21st century: Gearing extractive industries towards sustainable development</i>. UNEP.

SURFACE AND UNDERGROUND MINE PLANNING AND DESIGN

Course Code:	GW806
Credits [ECTS]:	7
Duration (weeks):	7

Period:	05 Jan 2026 – 21 Feb 2026
Lecturer: Counterpart Lecturer:	Dr. Godwin Ativor Gracia Pultoo, MSc
Prerequisite knowledge:	
Relationship to other courses within the program:	<ul style="list-style-type: none"> • Mineral Project Evaluation principles • Elementary knowledge of surface and underground mining technology. • Environmental and social costs aspects of mining. • Basic ground fragmentation principles and mine machinery
Brief Description:	<p>Mining constitutes an important aspect of the economy of many countries. The fluctuations in commodity prices in the mining industry can change a mining operation from being a profitable business into a non-viable venture. In order to minimise the influence of such market changes, mines must be planned and designed for effective and efficient operation by incorporating economic, engineering, technological, and environmental as well as social considerations. This course comprises both surface and underground mine planning principles required to plan a profitable mining venture that respects the laws and regulations of the host country as well as other stake holders. Computer aided techniques required for optimum planning are recommended in this course. The major factors influencing the establishment of a mine and its continued existence are also discussed.</p>
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>To equip students with Surface and underground mine planning and design concepts. The course will also enable students to appreciate and apply the Planning, Scheduling using pit optimization techniques.</p> <p>By the end of the module, a candidate will be able to:</p> <ul style="list-style-type: none"> • Explain the fundamental concepts of surface and underground mine planning and design. • Apply pit optimization techniques for planning and scheduling in surface mining operations. • Describe the stages involved in the development and excavation of underground mines. • Differentiate between various methods of opening underground deposits, considering terrain and deposit type. • Determine appropriate sizes, shapes, and support requirements for mine entries based on geotechnical and operational factors. • Integrate planning, design, and scheduling principles into the development of comprehensive mine plans. • Evaluate the technical, safety, and economic implications of different mine design choices for both surface and underground operations.
Teaching Method:	Course lectures
Method of Examination:	Written exam, Oral presentation, Essay writing
Final Mark:	Written exam 45% + Oral presentation 10% + Essay 45%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Bhattacharya, J. (2007), Principles of Mine Planning, Allied Publishers Private Limited, India, 505 pp. • Dowd, P. A. and Onur, A. H. (1992). "Optimising open pit design and sequencing", In Proc. 23rd International APCOM Symposium, pp. 411-422 • Hustrulid W. A., Kuchta M. and Martiin R. K. (2013), Open Pit Mine Planning and Design, Two Volume Set & CD-ROM Pack, Third Edition, CRS Press, 1308 pp.

	<ul style="list-style-type: none"> • Lerchs, H. and Grossman. Fl. (1964), "Optimum Design of Open-pit Mines". In Operations Research, Vol. 12, pp. B59. • Read, J. and Stacey, P. (2009), Guidelines for Open Pit Slope Design, CRC Press, 510 pp. • Villaescusa, E. and Potvin, Y. (2004), "Ground Support in Mining and Underground Construction", Proceedings of the Fifth International Symposium on Ground Support, Perth, Australia, 1270 pp. • Gertsch, R. E and Bullock, R. L. (1998), Techniques in Underground Mining, Society for Mining, Metallurgy and Exploration Inc., 823 pp.
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ADVANCED DRILLING AND BLASTING

Course Code:	GW808
Credits [ECTS]:	7
Duration (weeks):	7
Period:	02 Mar 2026 – 18 Apr 2026
Lecturer:	Dr Clement Kweku Arthur
Counterpart Lecturer:	
Prerequisite knowledge:	Fundamentals of Mine Engineering, Mine Rock Mechanics
Relationship to other courses within the program:	Complementary course: Mine Rock Mechanics
Brief Description:	This course highlights the different methods of ground fragmentation in Drilling and blasting. The types of explosives and their properties. Blasthole loading methods and blast initiation. Introduction to delay blasting. Underground and surface blast design. Environmental impact of blasting. This course also focusses on safe handling and use of commercial explosives as well as conducting analyses regarding blasting issues in the mining and allied industries.
Course Objectives and Learning Outcome:	After successful completion of the course, the students will be equipped with practical knowledge in rock fragmentation techniques in both surface and underground, and be able to analyze blasting issues in the mining and allied industries
Teaching Method:	Interactive online sessions with instructor covering theoretical and practical aspects of advanced drilling and blasting. Furthermore, there will be practical simulations to apply learned concepts in real-world scenarios. There will also be students' oral presentations, assignments, further guidance on the course content and assistance in essay writing.
Method of Examination:	Assignment, Oral presentation, written exam
Final Mark:	Assignment 10% + Oral presentation 45% + Written exam 45%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Gokhale, B V. (2011), Rotary Drilling and Blasting in Large Surface Mines, CRC Press, Boca Raton, 747 pp. • Konya, C. J. and Walter, E. J. (1990), Surface Blast Design, Prentice Hall, Eaglewood Cliffs, New Jersey, 303 pp. • Oloffson, S. O. (1990), Applied Explosives Technology for Construction and Mining, Applex, Sweden, 304 pp. • Persson, P. A., Holmberg, R. and Jaimin, L. (2018), Rock Blasting and Explosives Engineering, CRC Press, New York, 560 pp.

MINE ROCK MECHANICS

Course Code:	GW911
Credits [ECTS]:	5
Duration (weeks):	5
Period:	01 Jun 2026 – 12 Jul 2026
Lecturer:	Dr. Samuel Nunoo
Counterpart Lecturer:	
Prerequisite knowledge:	
Relationship to other courses within the program:	
Brief Description:	The objective of the course is to show the inter-dependency of geology and civil engineering projects, especially within the scope of rock mechanics, and application within the mining space. Prior to all forms civil engineering projects, which mining forms an integral part, are all carried on or in the ground. Thorough understanding of the origin and geologic history of the rocks present are vital to the success in civil engineering construction, and in mining design. The prime focus is to understand the application of rock mechanics in mining-related design and operations.
Course Objectives and Learning Outcome:	<p>This module aims to:</p> <p>At the end of the module, a candidate will be able to:</p> <ul style="list-style-type: none"> • Demonstrate understanding of rock mass classification systems and their application in engineering design. • Analyze soil-water interactions and their impact on ground stability and construction performance. • Identify and compare ground improvement techniques such as stabilization, dewatering, grouting, and rock bolting. • Assess the role of engineering geology in the planning and construction of infrastructure, including roads, dams, and tunnels. • Apply fundamental principles of rock mechanics and engineering geology to solve practical problems in civil and mining engineering contexts.
Teaching Method:	Online lectures
Method of Examination:	Practical presentation and case studies
Final Mark:	Course work 40% + Take home assignment 60%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Applied Rock Mechanics and Ground Stability, 2nd Ed. D.H. Steve Zou • Fundamentals of Rock Mechanics, 4th Ed. J.C. Jaeger, N.G.W. Cook and R.W. Zimmerman • Jackson, N. and Dhir, R.K., 1996, Civil Engineering Materials, Fifth Edition, Macmillan. • Waltham. T. 2009. Foundations of Engineering Geology. Third Edition Spon Press. • Price, D. G. 2009, Engineering Geology, Principles and Practice Springer, • Kehew. A. E. 2006, Geology for Engineers & Environmental Scientists. Third Edition, Prentice Hall. • Roberts A. 1977, Geotechnology, An introductory text for students and engineers, Pergamon Press

MINE MECHANIZATION AND MATERIAL HANDLING

Course Code:	GW913
Credits [ECTS]:	5
Duration (weeks):	5
Period:	27 Jul 2026 – 06 Sep 2026
Lecturer:	Dr Clara Akalanya Abuntori
Counterpart Lecturer:	Ramon Finkie, MSc
Prerequisite knowledge:	Introduction to Mining Engineering
Relationship to other courses within the program:	The course compliments future courses on advanced drilling and blasting, mine rock mechanics, mine ventilation
Brief Description:	This course provides a comprehensive overview of materials handling equipment and systems used in both surface and underground mining operations. Students will explore various haulage systems, including belt conveyors, truck haulage, and rail haulage, as well as excavators and loaders such as shovels, front-end loaders (FEL), load-haul-dumps (LHD), and draglines. The course also covers the factors influencing the selection and organization of materials handling systems, equipment scheduling strategies, and effective stockpiling techniques to optimize material flow. Through practical applications and analysis, students will gain the skills to evaluate and select appropriate materials handling systems for specific mining operations.
Course Objectives and Learning Outcome:	<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> • Identify and describe the various materials handling equipment and systems used in surface and underground mining operations. • Analyze the applications and selection of different haulage systems, including belt conveyors, truck haulage, and rail haulage. • Evaluate the productivity, selection, operational capabilities and limitations of excavators and loaders such as shovels, front-end loaders (FEL), load-haul-dumps (LHD), tractor scrapers, bucket wheel excavators (BWE), bucket chain excavators (BCE), draglines, slushers and dozers. • Assess the factors involved in the selection and organization of materials handling systems in mining operations. • Develop effective equipment scheduling plans and strategies for optimizing stockpiling and material flow.
Teaching Method:	Lectures using online course delivery, Tutorials, Assignments.
Method of Examination:	Oral presentation, essay, written exam
Final Mark:	Oral presentation 10% + essay 45% + written exam 45%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • Anon (2000), Handbook of Conveyor and Elevator Belting, Goodyear Tire and Rubber Company, Creative Media Partners, 338 pp. • Kennedy, B.A. and Kennedy, B.A. eds. (1990), Surface mining, SME, Society for Mining, Metallurgy, and Exploration (U.S.), 1194 pp. • Frutchbrum, J. (1988), Bulk Materials Handling Handbook, Springer, DOI https://doi.org/10.1007/978-1-4757-4695-2, 488 pp.

MINE DRAINAGE AND DEWATERING

Course Code:	GW915
Credits [ECTS]:	5
Duration (weeks):	5

Period:	05 Oct 2026 – 07 Nov 2026
Lecturer: Counterpart Lecturer:	Emmanuel Buaba, MSc Oclaya Verwey, PhD Candidate
Prerequisite knowledge:	Fluid Mechanics, Rock Mechanics
Relationship to other courses within the program:	Mine Planning and Design
Brief Description:	This course provides an introduction to the role and management of water in mining environments. Students will explore the sources of mine water—such as groundwater and precipitation—and examine the challenges it presents to both surface and underground mining operations. Key topics include mine drainage system design and implementation, as well as dewatering techniques such as pumping, gravity drainage, and well systems. The course also introduces fundamental concepts of hydrogeology and groundwater flow relevant to effective water control in mines.
Course Objectives and Learning Outcome:	<p>1. Understanding the Effect of Water in Mining</p> <ul style="list-style-type: none"> • Explain the basic hydrogeological concepts relevant to mine drainage and dewatering. • Describe the behavior of groundwater and surface water in mining areas. • Identify water-bearing formations and aquifers, and understand their impact on mining activities. <p>2. Methods of Controlling Water in Mines</p> <ul style="list-style-type: none"> • Differentiate between surface and underground water control methods. • Understand the methods taken to prevent water accumulation in underground and surface mines. • Assess the effects of poor water management on mine safety, operations, and environmental sustainability. <p>3. Dewatering Techniques Used in Underground and Surface Mines</p> <ul style="list-style-type: none"> • Identify different dewatering methods (pumping, grouting, drainage galleries, etc.) used in mining operations. • Analyze the factors that influence the selection of dewatering techniques for different types of mines. • Design and optimize dewatering systems for both surface and underground mines. <p>4. Mine dewatering equipment</p> <ul style="list-style-type: none"> • Understand the various equipment used in dewatering operations (pumps, sumps, piping systems). • Evaluate the advantages and limitations of different dewatering technologies and innovations. • Understanding the procedure for pump selection
Teaching Method:	<ul style="list-style-type: none"> • Course Handout: A handout of the Course will be sent to the students. • Live sessions: Hold interactive live classes via Zoom and record the videos. • Youtube videos: Explain operating principles of some equipment from Youtube. • Assignments: Give assignments based on hydrological calculations, flow rate estimations, and dewatering system design. • Encourage students to develop drainage plans for hypothetical or real mines and submit their designs as assignments.

	<ul style="list-style-type: none"> • Conduct regular quizzes to test understanding of key concepts, such as types of mine drainage, methods of groundwater control, and the environmental regulations related to mine water. • Give tutorials on worked examples to explain various aspects of Mine dewatering. • Include mid-term and final assessments that involve both theoretical questions and practical design tasks.
Method of Examination:	Assignments, quizzes, mid-test, coursework, final exam
Final Mark:	Assignments 10%, quizzes 10%, mid-test 10%, coursework 20%, final exam 50%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • "Mine Water: Hydrology, Pollution, Remediation" by Paul L. Younger, S.A. Banwart, and Robert S. Hedin • "Mine Dewatering: A Regulatory Overview and Introduction to Current Practices" by U.S. Department of the Interior • "Mine Wastes: Characterization, Treatment, and Environmental Impacts" by Bernd G. Lottermoser • "Groundwater in Geologic Processes" by Steven E. Ingebritsen and Ward E. Sanford • "Environmental Impacts of Mining Monitoring, Restoration, and Control" by Mritunjoy Sengupta • "Engineering Hydrology" by E.M. Wilson

MINE VENTILATION

Course Code:	GW1006
Credits [ECTS]:	5
Duration (weeks):	5
Period:	16 Nov 2026 – 19 Dec 2026
Lecturer:	Sylvester Yenzanya, MSc
Counterpart Lecturer:	
Prerequisite knowledge:	<ul style="list-style-type: none"> • Underground Mine Planning and Design • Mine Machinery and mechanization • Mine Drainage and Dewatering
Relationship to other courses within the program:	<ul style="list-style-type: none"> • Elementary knowledge of the layout of underground mines and development infrastructure. • Elementary knowledge of equipment and machinery used in underground mining operations.
Brief Description:	The mine ventilation course provides students with: advance understanding of comprehensive environmental control of the mine atmosphere taking into consideration the quality, quantity, and temperature-humidity of the underground environment; understanding of the characterization of underground airflow and ventilation networks; integrated engineering approach to mine ventilation and air conditioning. It exposes them to efficient and effective management of mine ventilation systems and simulation techniques in subsurface environment. Its design makes it very useful for both fresh and practicing ventilation engineers.
Course Objectives and Learning Outcome:	At the end of the course, students should be able to: <ul style="list-style-type: none"> • Determine the quantity of air required for any given mine; • Determine the pressure required for any given mine operation; • Analyse and solve a ventilation network;

	<ul style="list-style-type: none"> • Select fans for given operation; • Manage the ventilation system proficiently; and • Proficiently use the VentSim Software.
Teaching Method:	Lecture, Videos, Simulation, Tutorials
Method of Examination:	Oral presentation, essay, software presentation, written exam
Final Mark:	Oral presentation 20% + essay 30% + software presentation 20% written exam 30%
Textbooks and/or Reference Books:	<ul style="list-style-type: none"> • McPherson, M. J. (1993), Subsurface Ventilation Engineering, 2nd ed., Chairman Mine Ventilation Services Inc., USA, pp. 88 - 92. • Hartman, H. L., Mutmanský, J. M., Ramani, R. V., & Wang, Y. J. (1997), Mine Ventilation and Air Conditioning, 3rd edition, John Wiley & Sons Publications, 752pp.

