GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Challenges of Deep and High Stress Mining (I002409)

Course size *(nominal values; actual values may depend on programme)*

Credits 5.0 **Study time 150 h**

Course offerings in academic year 2026-2027

A (semester 1) English Gent

Lecturers in academic year 2026-2027

Durrheim, Raymond UPPSALO1 lecturer-in-charge

Offered in the following programmes in 2026-2027	crdts	offering
International Master of Science in Sustainable and Innovative Natural Resource Management	5	A

Teaching languages

English

Keywords

Position of the course

As shallow resources are depleted, mining is expected to take place at ever-increasing depths. Safe, healthy and profitable deep mining is only possible if many serious challenges are overcome. For example, rock temperatures will increase, requiring improved ventilation and cooling. Changes in air pressure can affect both the eardrums of mine workers and the calibration of instruments to measure flammable gases. Rock stresses will increase to the point that the rock strength is exceeded, resulting in mining-related seismicity and rock bursting. Consequently, it is imperative that seismogenic structures are recognised in advance and those excavations are reinforced to be rockburst resistant. In this course, we will look at technical and management strategies to meet these challenges.

Contents

Deep mining will become common in the future as coal and mineral resources at shallow depths gradually become exhausted. Projections of global demand and supply of minerals and metals over the next century and resulting need for additional deep mining. Overview of current deep mining activities around the globe. Rock mechanics and stress calculations, overburden pressures and stress fields, induced seismicity. Identification of seismogenic structures. Catastrophic events seen in deep mining engineering: rockbursts, gas outbursts, high in situ and redistributed stresses, large deformation, squeezing and creeping rocks, and high temperature. Strategies for preventing or limiting such mining hazards. Increasing depth and rock temperatures, ventilation and cooling requirements. Air pressure changes and impacts on miners and instruments. Conditions for suitable work environments and how to achieve them deep underground. Development of automated mining technology and possibilities of automation.

Initial competences

90 credits in science/engineering (physics, chemistry, biology, mathematics, earth science, computer science, material science), including 15 credits in mathematics or physics and 10 credits in chemistry.
Proficiency in English equivalent to the Swedish upper secondary course English 6.

Final competences

1 On completion of the course the student shall be able to:

- demonstrate proficient consideration and treatment of mining challenges imposed by rock mechanics, seismicity, etc.

2 • provide informed insight into work environment hazards arising from increasing depth, such as ventilation, temperature control, explosive gas detection and other factors affecting miners.
3 • critically assess technical and skill requirements necessary for practical and safe deep mining operations
4 • evaluate economic challenges and environmental hazards of proposed mining plans in deep and high stress environments

Conditions for credit contract

This course unit cannot be taken via a credit contract

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Practical

Extra information on the teaching methods

Lectures, seminars, case studies and practical exercises.

Study material

None

References

Selected papers and books

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Participation, Written assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Participation, Written assessment

Examination methods in case of permanent assessment

Participation, Presentation, Assignment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Hand-in exercises (2 hp), active participation in group work and seminar presentation (1 hp), written examination (2 hp).
If there are special reasons for doing so, an examiner may make an exception from the method of assessment indicated and allow a student to be assessed by another method. An example of special reasons might be a certificate regarding special pedagogical support from the disability coordinator of the university.

Calculation of the examination mark