

MODULE TITLE	Mining and Surveying	CREDIT VALUE	15
MODULE CODE	CSM2180	MODULE CONVENER	Dr Andrew Wetherelt (Coordinator)
DURATION: TERM	1	2	3
DURATION: WEEKS	9		
Number of Students Taking Module (anticipated)	40		

DESCRIPTION - summary of the module content

This module follows on from both the Surveying and CAD and Mining and Minerals Engineering modules that are delivered in year 1. The Mining element of this module is a conventional classroom based taught component of the module. The surveying element is undertaken via two practical survey courses namely the Summer Survey course and the Underground Survey course. This latter course is undertaken at CSM's Test Mine facility.

*Students should have studied CSM1029 and CSM1028
This module is unsuitable for non-specialist students.
This module is not recommended for interdisciplinary pathways*

AIMS - intentions of the module

This course provides further study of the commercial use of explosives, an overview of mine development techniques, and the study of mine drainage. This course introduces the student to the selection of underground mining methods and their associated extraction systems.

The course further provides a major practical surface surveying exercise which is held over three weeks after the first year June exams at the Tremough Campus. The course also provides for 1 week of practical underground surveying undertaken during Activities Week in the first semester at the CSM Test Mine field station.

INTENDED LEARNING OUTCOMES (ILOs) (see assessment section below for how ILOs will be assessed)

On successful completion of this module **you should be able to:**

Module Specific Skills and Knowledge

- 1.A basic understanding of the factors involved in the path to a blast design
- 2.A knowledge of the various techniques available for all facets of underground mine development
- 3.A basic understanding of the options and operating characteristics of various rock handling extraction systems
- 4.A basic understanding of the problems of mine water and the methods of its amelioration.
- 5.A competence in the use of modern surveying instruments.
- 6.The ability to carry out a topographical survey of a mine site.
- 7.Competence in carrying out underground surveying activities
- 8.The ability to apply theoretical knowledge of surveying techniques and calculations in a simulated industrial situation.

Discipline Specific Skills and Knowledge

- 9.The ability to evaluate and apply knowledge to appropriate mining and surveying situations

Personal and Key Transferable / Employment Skills and Knowledge

- 10.An ability to identify key areas of problems and choose appropriate tools/methods for their resolution in a considered manner
- 12.An ability to interact effectively within a team/learning group, giving and receiving information and ideas and modifying responses where appropriate

SYLLABUS PLAN - summary of the structure and academic content of the module

Weeks 1-2

Explosives Engineering - The explosion process, general principles of the dynamic effects of blasting and rock fracture. Optimum design of simple blasts for tunnelling, stoping and quarrying; fragmentation; design of multi-row blasts, influence of delayed detonation and rock structure; mechanics of rock breaking with inclined and vertical holes, operational problems; pre-splitting and smooth-wall blasting. Environmental problems; flyrock, air-blast and ground vibration.

Weeks 3-4

Shaft Sinking and Development - Factors determining shaft selection and location. Collar designs, high speed sinking of vertical shafts, lining and equipping. Conventional and boring methods. Shaft deepening. Rock hoisting methods. Hoisting regulations. Development techniques for raising. Raiseboring.

Weeks 5-6

Mine Drainage - Inflow control. Active and passive dewatering methods and removal of mine water. Design and siting considerations for pumping stations, sumps, settlers and sludge pumping. Precautions in proximity to aquifers, mine and other workings including provisions of Mines and Quarries legislation. Flood control, watertight doors.

Weeks 7-8

Underground Rock Handling - Gravitational systems, characteristics of orepasses, Operational characteristics of scrapers, rockershovels, load-haul-dump equipment, influence on development design and mining techniques, future trends. Main haulage systems.

Week 9

Underground Extraction Systems - Stopping: classification of methods; the influence of geological factors, virgin and induced stress fields and rates of extraction. Development ratios, recovery and dilution. Selection of methods; open, filled and caving systems, pillar recovery. Optimisation of extraction and mining efficiencies. Case examples.

Surface Survey Course : Layout of networks. Precise theodolite traverse. Use of theodolite, EDM and total stations along with DGPS. Standards of accuracy required. Calculations for station coordinates. Selection of instrumentation. Selection of survey stations. Computations for bearing, coordinates and elevations with closing errors and adjustments. Levelling. Station elevations determined by a range of instrumentation and techniques to precise and subsidiary survey standards. Calculation of reduced levels and distribution of closing error. Detail survey by total station, offsetting and radial pickup..

Underground Survey Course: Connection to underground grid from control stations on surface. Underground control network surveying using wall stations along with 3D detail pick up.

Both courses : Preparation of group(5 students) written survey report including computations and field records to meet client specification. Presentation of group (5 students) plan based on data input into LSS and onward to plan production using Auto Cad.

LEARNING AND TEACHING

LEARNING ACTIVITIES AND TEACHING METHODS (given in hours of study time)

Scheduled Learning & Teaching Activities	136.00	Guided Independent Study	14.00	Placement / Study Abroad
---	---------------	---------------------------------	--------------	---------------------------------

DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description
----------	---------------------	-------------

Category	Hours of study time	Description
Scheduled learning & teaching activities	36	Lectures
Scheduled learning & teaching activities	100	Surveying fieldwork
Guided independent study	14	Lecture & assessment preparation; private study

ASSESSMENT

FORMATIVE ASSESSMENT - for feedback and development purposes; does not count towards module grade

None

SUMMATIVE ASSESSMENT (% of credit)

Coursework	60	Written Exams	40	Practical Exams
-------------------	----	----------------------	----	------------------------

DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of Credit	Size of Assessment (e.g. duration/length)	ILOs Assessed	Feedback Method
Examination	40	1.5 hours	1-4, 10	Tutor meeting
Mining – Laboratory report - Explosives laboratory examining vibration and air overpressure	10	750 words, not including diagrams, tables and appendices	1, 10,11	Comments on marking cover sheet
Surface survey course - A Group (5 students) surface plan depicting the area of survey will be produced at the end of the summer three week long survey, additionally a group (5 students) report outlining the methods undertaken and the results obtained during the survey needs to be submitted by the end of the survey period.	25	Plan + report of 750 words - , not including diagrams, tables and appendices	5-6, 8-11	Comments on submitted plans and survey report
Underground survey course - An underground survey will be conducted during Semester 1 Activities Week, where a group (5 students) report and group (5 students) plan is produced	25	Plan + report of 750 words - , not including diagrams, tables and appendices	5-11	Comments on submitted plans and survey report

DETAILS OF RE-ASSESSMENT (where required by referral or deferral)

Original Form of Assessment	Form of Re-assessment	ILOs Re-assessed	Time Scale for Re-reassessment
Summative assessment	Additional assessment	As above	August Ref/Def period
Examination	Additional examination	As above	August Ref/Def period

RE-ASSESSMENT NOTES

As above 1 piece of CW 60% and/or 1 Exam 40%

RESOURCES

INDICATIVE LEARNING RESOURCES - The following list is offered as an indication of the type & level of information that you are expected to consult. Further guidance will be provided by the Module Convener

Basic reading:

Atlas Powder Company 1987. Explosives and Rock Blasting

SME Handbook 2011 Edition (Darling)

ELE – College to provide hyperlink to appropriate pages

Reading list for this module:

Type	Author	Title	Edition	Publisher	Year	ISBN	Search
Set	Hartman, H.L.	Mining Engineering Handbook	2nd	Society for Mining Engineers	1992		[Library]

CREDIT VALUE	15	ECTS VALUE	7.5
---------------------	----	-------------------	-----

PRE-REQUISITE MODULES CSM1028, CSM1029

CO-REQUISITE MODULES

NQF LEVEL (FHEQ)	2 (NQF Level 5)	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Wednesday 27 June 2012	LAST REVISION DATE	Wednesday 17 October 2012

KEY WORDS SEARCH Mining techniques, surface surveying, underground surveying.