

MODULE TITLE	Hazard and Risk Assessment	CREDIT VALUE	30
MODULE CODE	CSMM101	MODULE CONVENER	Prof Patrick Foster (Coordinator)
DURATION: TERM	1	2	3
DURATION: WEEKS	10		
Number of Students Taking Module (anticipated)	35		

DESCRIPTION - summary of the module content

This module looks at "risk" in its most common applications within industry today, which is related to (i) projects and engineering design and (ii) health and safety management. Content is highly vocational and the skills and knowledge gained will be beneficial and used by students whilst in employment, particularly in the extractives industry.

AIMS - intentions of the module

The module provides an introduction to hazard and risk assessment methods and legislation and provides theoretical and practical case examples applicable to typical projects in mining and civil engineering. It is intended that the students learn from a combination of traditional lectures, assignments and site visits, supported by the use of ELE and other electronic methods

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

Module Specific Skills and Knowledge:	
1	The ability to select suitable forms of hazard and risk assessment for a range of processes / systems.
2	The ability to undertake qualitative, order of magnitude and comprehensive quantitative risk assessments
3	Suitable awareness of risk-based legislation applicable the Mining, Quarrying and Civil Engineering industries.
4	An understanding of risk perception by various stakeholders (e.g. companies, local authorities and individuals).
Discipline Specific Skills and Knowledge:	
5	The ability to obtain and critically evaluate suitable data in a Mining or Civil Engineering context to permit formal risk assessment
6	The ability to plan and conduct a range of risk assessments, including considerations of risk acceptance and mitigation
Personal and Key Transferable/ Employment Skills and Knowledge:	
7	The ability to develop and apply the use of spreadsheets with graphics to comprehensive risk assessments
8	The ability to present probability and risk arguments / analyses to appropriate professionals
9	The ability to critically evaluate a design problem and produce, to a strict deadline, detailed recommendations / reasoned arguments for an appropriate solution.
10	The ability to source further information for updating knowledge and practice in hazard and risk assessment.

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

Typical elements of the syllabus are as follows, in approximate chronological order.

Week 1

Introduction; Hazard and risk terminology; Risk Assessment in UK Legislation: COMAH Regulations, COSHH Regulations; Quarry Regulations, 1999. Overseas Mining Regulations

Week 2

Hazard appraisal / identification; Hazard consequence / vulnerability ; Accident Aetiology: Basic theories of accident causation, the role of human error in accidents, concept of active and latent failures. Strategies for reducing human error;

Week 3

Probability / frequency of occurrence / trigger events; Probability of failure and factor of safety (include safety margin, reliability); Case example: geotechnical hazard appraisal and risk assessment for quarries
Health and Safety Management: Introduction, Systems approach, key elements of a H&S management system, Recent developments Ö-BS8800, OHSAS 18001/2;

Week 4

Assignment: geotechnical hazard appraisal and risk assessment for quarries
Subjective and Quantitative risk assessment tools and techniques for safety

Week 5

Fault trees and Event trees; Bayesian methods for managing uncertainty ; Health Assessment & Surveillance: Health risks, Health risk management, Health Surveillance Programmes.

Week 6

Case example: risk assessment new highway in highly seismic area; Tolerability of risk / F-N curves. Risk management / mitigation / ALARP;
Accident & Incident Investigations;

Week 7

Monte-Carlo simulation ; Setting of summative assignment e.g. for risk analysis in dam design
Case example: risk assessment for tailings dam rehabilitation in Spain;
Safety Culture & Safety Maturity Charts.

Week 8

Case example: risk assessment for rock slopes in Hong Kong;
Case example: risk assessment for managing cyanide in gold extraction process; Assessment of Health Risks

Week 9

Case example: risk assessment for underground radioactive waste disposal; Demonstration: Environment Agency programs LANDSIM and CONSIM

Week 10

Further case examples; Review of material completed in module.

LEARNING AND TEACHING

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

Scheduled Learning & Teaching Activities	56.00	Guided Independent Study	244.00	Placement / Study Abroad	
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DETAILS OF LEARNING ACTIVITIES AND TEACHING METHODS

Category	Hours of study time	Description

Lectures and seminars	40 hrs	The learning and teaching methods include lectures and seminars supported with ELE applied to all intended learning outcomes; assignments applied primarily to ILO's 1,2,4, 5, 6,7 and 10, group discussions and presentations applied primarily to ILO's 7,8 and 9.
Field visits	16 hrs	Applied primarily to ILO's 4, 5, 8.

ASSESSMENT

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

SUMMATIVE ASSESSMENT (% of credit)

Coursework	50	Written Exams	50	Practical Exams
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DETAILS OF SUMMATIVE ASSESSMENT

Form of Assessment	% of credit	Size of the assessment e.g. duration/length	ILOs assessed	Feedback method
Examination	50%	2 hours	ILOs 1-6	
Coursework - Two written assignments contribute 50 % of the overall module assessment. The two summative assignments are used to develop understanding of key aspects. Each is based on actual project data or data obtained by the students themselves. Assignments are selected from the following typical examples and address the numbered intended learning outcomes indicated: Hazard appraisal and risk assessment at a local quarry, as required by the Quarries Regulations (1999): 2,3,4,5,6,8 ; Qualitative risk assessment and mitigation of potentially hazardous working conditions in underground mining: 2,3,4,5,6,8 ; Risk assessment and risk based design for potentially unstable rock slopes adjacent to active roads: 1,2,5,6,7,8, 9 ; Risk assessment and mitigation in use of toxic chemicals in mineral processing: 1,2,3,5,6,7,9 ; Risk assessment of stability of water and tailings dams: 1,2,3,5,6,7,8,9 Risk assessment of transport operations in quarrying or underground mining: 2,3,4,5,6,7,8,9. The assignments typically take the form of a technical reports of maximum 1500 words, together with appropriate use of graphs, calculations, references. Emphasis is on interpretation, recommendations and where appropriate, worked solutions. In addition, formative assignments are embedded in lectures / seminars. Typically these might include : development of a hazard influence diagram and associated fault tree for a subject of student choice: 1,7,8; team effort using the Delphi system for risk assessment avoiding subjective bias: 1,7,8. team analysis and presentation of hazards determined from a local quarry visit: 2,3,4,5,8,9.	50%	1500 word equivalent per assignment.		Written

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-assessment
Summative Assessment	Additional Summative assignment	Weighting as above	August Ref/Def period
Examination	Additional Examination	Weighting as above	August Ref/Def period

RE-ASSESSMENT NOTES

As above 1 piece of CW 50% and/or 1 Exam 50%

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:
General
Texts:

Australian/New Zealand Standard 4360 (1995). Risk Management

British Standards Organisation (1996) BS8800: Guide to Occupational Health & Safety Management Systems, BSI.

British Standards Organisation (1999) OHSAS 18001: Occupational Health & Safety Management Systems Specification.

British Standards Organisation (2000) OHSAS 18002: Occupational Health & Safety Management Systems – Guidelines for the Implementation of 18001. Cox SJ & Tait NRS (1991) Reliability, Safety and Risk Management: An Integrated Approach, Butterworth-Heinemann Ltd, UK

Glendon AI & McKenna EF (1995) Human Safety and Risk Management, Chapman & Hall, UK

Hambly E.C. and Hambly E.A. (1994). Risk evaluation and realism. Proc. Instn Civ. Engrs, Civ. Engng, 102, pp 64-71.

Harr M.E. (1987). Reliability based design in civil engineering. McGraw Hill , NY

Health and Safety Commission UK (1999). Quarries Regulations 1999 , Approved Code of Practice and Guidance

Health and Safety Commission (UK) (1999) Management of Health & Safety at Work Regulations, 1999, Approved Code of Practice (updates to Management of Health and Safety at Work Regulations, 1992).

Health and Safety Executive (UK) (1995). Managing construction for health and safety, Approved code of practice. HSE Books.

Health and Safety Executive (1990). The tolerability of risk from nuclear power stations. HMSO. ISBN 0-11-886368-1

Health and Safety Executive (1997) Successful Health & Safety Management HS(G)65, HSE Books.

Health and Safety Executive (1993) ACSNI Study Group on Human Factors 3rd Report: Organising for Safety, HSE Books.

Health and Safety Executive (1998) Reducing error and influencing behaviour HS(G)48, HSE Books.

Institution of Civil Engineers (1998). Risk analysis and management of projects (RAMP), handbook. Thomas Telford, London.

New South Wales Department of Mineral Resources (1997). Risk Management Handbook for the Mining Industry, MDG 1010,

Pine, R.J. and Roberds, W.J. (2005) A risk-based approach for the design of rock slopes subject to

multiple failure modes illustrated by a case study in Hong Kong. Int.J. Rock Mech. 42 p261-275.

Royal Society Safety Group (1992). Risk-Analysis, perception and management. Royal Society.

Websites:

www.environment-agency.gov.uk/gwcl/consim.html

www.hse.gov.uk

www.ramprisk.com

[dfb/teaching/module1](#)

ELE - College to provide hyperlink to appropriate pages

Reading list for this module:

There are currently no reading list entries found for this module.

CREDIT VALUE	30	ECTS VALUE	15
PRE-REQUISITE MODULES	None		
CO-REQUISITE MODULES	None		
NQF LEVEL (FHEQ)	M (NQF Level 7)	AVAILABLE AS DISTANCE LEARNING	No
ORIGIN DATE	Monday 12 March 2012	LAST REVISION DATE	Wednesday 17 October 2012
KEY WORDS SEARCH	Risk analysis, risk management, risk assessment, safety		