ENAR12014 *Introduction to Mining Technology*
Term 1 - 2024

Profile information current as at 03/09/2024 11:28 pm

All details in this unit profile for ENAR12014 have been officially approved by CQUniversity and represent a learning partnership between the University and you (our student).The information will not be changed unless absolutely necessary and any change will be clearly indicated by an approved correction included in the profile.

General Information

Overview
This unit introduces students to the improved sustainability, safety and productivity achieved in mining through the use of new technologies. You will learn about different types of sensors used to collect data from mining equipment and how that data can be collected and analysed. You will investigate the development and optimisation of mine designs using technology developed for Australian mining operations. There will be a particular focus on data collection and analysis, blast design and truck and shovel operations. You will use online forums, tutorials and learning journals to demonstrate effective and professional levels of collaboration and communication.

Details
Career Level: *Undergraduate*
Unit Level: *Level 2*
Credit Points: *6*
Student Contribution Band: *8*
Fraction of Full-Time Student Load: *0.125*

Pre-requisites or Co-requisites
There are no requisites for this unit.
Important note: Students enrolled in a subsequent unit who failed their pre-requisite unit, should drop the subsequent unit before the census date or within 10 working days of Fail grade notification. Students who do not drop the unit in this timeframe cannot later drop the unit without academic and financial liability. See details in the Assessment Policy and Procedure (Higher Education Coursework).

Offerings For Term 1 - 2024

- Online

Attendance Requirements
All on-campus students are expected to attend scheduled classes – in some units, these classes are identified as a mandatory (pass/fail) component and attendance is compulsory. International students, on a student visa, must maintain a full time study load and meet both attendance and academic progress requirements in each study period (satisfactory attendance for International students is defined as maintaining at least an 80% attendance record).

Website
This unit has a website, within the Moodle system, which is available two weeks before the start of term. It is important that you visit your Moodle site throughout the term. Please visit Moodle for more information.

Class and Assessment Overview

Recommended Student Time Commitment

Each 6-credit Undergraduate unit at CQUniversity requires an overall time commitment of an average of 12.5 hours of study per week, making a total of 150 hours for the unit.

Class Timetable

Regional Campuses
Bundaberg, Cairns, Emerald, Gladstone, Mackay, Rockhampton, Townsville

Metropolitan Campuses
Adelaide, Brisbane, Melbourne, Perth, Sydney

Assessment Overview

1. **Written Assessment**
Weighting: 20%
2. **Written Assessment**
Weighting: 30%
3. **Report**
Weighting: 40%
4. **Portfolio**
Weighting: 10%

Assessment Grading

This is a graded unit: your overall grade will be calculated from the marks or grades for each assessment task, based on the relative weightings shown in the table above. You must obtain an overall mark for the unit of at least 50%, or an overall grade of 'pass' in order to pass the unit. If any 'pass/fail' tasks are shown in the table above they must also be completed successfully ('pass' grade). You must also meet any minimum mark requirements specified for a particular assessment task, as detailed in the 'assessment task' section (note that in some instances, the minimum mark for a task may be greater than 50%). Consult the University's Grades and Results Policy for more details of interim results and final grades.

CQUniversity Policies

All University policies are available on the CQUniversity Policy site.
You may wish to view these policies:

- Grades and Results Policy
- Assessment Policy and Procedure (Higher Education Coursework)
- Review of Grade Procedure
- Student Academic Integrity Policy and Procedure
- Monitoring Academic Progress (MAP) Policy and Procedure – Domestic Students
- Monitoring Academic Progress (MAP) Policy and Procedure – International Students
- Student Refund and Credit Balance Policy and Procedure
- Student Feedback – Compliments and Complaints Policy and Procedure
- Information and Communications Technology Acceptable Use Policy and Procedure

This list is not an exhaustive list of all University policies. The full list of University policies are available on the CQUniversity Policy site.

Previous Student Feedback

Feedback, Recommendations and Responses

Every unit is reviewed for enhancement each year. At the most recent review, the following staff and student feedback items were identified and recommendations were made.

Feedback from Student feedback and self reflection.

Feedback
Include updated blasting content.

Recommendation
Update safe and efficient blasting content based on industry best practices.

Feedback from Student feedback and self assessment.

Feedback
Include updated ventilation content and assessment.

Recommendation
Update ventilation measurements and calculations content and include them in the appropriate assessment items.

Feedback from Student feedback and self assessment.

Feedback
Improve the organisation of the course content.

Recommendation
Scaffold the updated learning material to improve the student's ability to build their knowledge of mining methods and the more technical aspects of blasting and ventilation.

Unit Learning Outcomes

On successful completion of this unit, you will be able to:

1. Evaluate the impact of technology on sustainability, safety and productivity in Australian mining
2. Investigate a data collection system for monitoring the performance of mining equipment
3. Apply given parameters to develop a drill and blast pattern for a coal or metalliferous deposit in a surface mining operation
4. Optimise truck and shovel operations in relation to surface mine layouts using appropriate software
5. Collaborate and communicate with lecturers and peers through the use of forums, learning journals and online tutorials.

Learning Outcomes 1 and 2 have been specifically written to address the requirements of the Minerals Council of Australia. The Council has asked for the inclusion of content that covers sustainability, data collection and analysis and automation as part of a course that will develop learning pathways to the modern mining sector.

The Learning Outcomes for this unit are linked with the Engineers Australia Stage 1 Competency Standards for Professional Engineers in the areas of 1. Knowledge and Skill Base, 2. Engineering Application Ability and 3. Professional and Personal Attributes at the following levels:

Introductory

2.1 Application of established engineering methods to complex engineering problem solving. (LO: 1N 3N 4N)

2.3 Application of systematic engineering synthesis and design processes. (LO: 2N 3N 4N)

2.4 Application of systematic approaches to the conduct and management of engineering projects. (LO: 4N)

3.1 Ethical conduct and professional accountability. (LO: 5N)

3.3 Creative, innovative and pro-active demeanour. (LO: 1N 2N 4N 5N)

3.5 Orderly management of self, and professional conduct. (LO: 5N)

Intermediate

1.1 Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline. (LO: 1N 3I 4N)

1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline. (LO: 1I 3I 4N)

1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline. (LO: 1I 2N 3N 4I)

1.4 Discernment of knowledge development and research directions within the engineering discipline. (LO: 1I 2N 3N 4I)

1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline. (LO: 1I 3I 4I)

1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline. (LO: 1I 2N 3I)

2.2 Fluent application of engineering techniques, tools and resources. (LO: 2N 3N 4I)

3.2 Effective oral and written communication in professional and lay domains. (LO: 1I 2N 3I 4N 5N)

3.4 Professional use and management of information. (LO: 1I 2I 3I 4I 5N)

Note: LO refers to the Learning Outcome number(s) which link to the competency and the levels: N – Introductory, I – Intermediate and A - Advanced.

Refer to the Engineering Undergraduate Course Moodle site for further information on the Engineers Australia's Stage 1 Competency Standard for Professional Engineers and course level mapping information
https://moodle.cqu.edu.au/course/view.php?id=1511

Alignment of Learning Outcomes, Assessment and Graduate Attributes

— N/A Level | • Introductory Level | • Intermediate Level | • Graduate Level | ∘ Professional Level | ∘ Advanced Level

Alignment of Assessment Tasks to Learning Outcomes

Assessment Tasks	Learning Outcomes				
	1	2	3	4	5
1 - Written Assessment - 20%	•	•			
2 - Written Assessment - 30%			•		
3 - Report - 40%				•	
4 - Portfolio - 10%					•

Alignment of Graduate Attributes to Learning Outcomes

Graduate Attributes	Learning Outcomes				
	1	2	3	4	5
1 - Communication	•		•	•	•
2 - Problem Solving		•	•	•	
3 - Critical Thinking	•	•	•	•	
4 - Information Literacy	•	•	•	•	
5 - Team Work					•
6 - Information Technology Competence		•	•	•	
7 - Cross Cultural Competence					•
8 - Ethical practice					•
9 - Social Innovation	•				•
10 - Aboriginal and Torres Strait Islander Cultures					

Textbooks and Resources

Textbooks

Information for Textbooks is not yet available.
The textbooks have not yet been finalised.

IT Resources

You will need access to the following IT resources:

- CQUniversity Student Email
- Internet
- Unit Website (Moodle)
- Word processing software (e.g. Microsoft Word)
- Zoom capacity (web cam and microphone)
- Excel spreadsheet software

Referencing Style

All submissions for this unit must use the referencing style: Harvard (author-date)
For further information, see the Assessment Tasks.

Teaching Contacts

Muhammad Qureshi Unit Coordinator
m.qureshi@cqu.edu.au

Schedule

Week 1 Introduction to Mining - 04 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Mining	Reading in Week 1 Moodle Block History of mining Mining terminology Advances in mining technology Value of minerals production to Australia	Weekly Zoom Tutorial Session - Course Introduction

Week 2 Safe, Productive and Sustainable Mining Methods - 11 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Safe, Productive and Sustainable Mining Methods	Reading in Week 2 Moodle Block Stages of mining - development and exploitation Changes in Safety Changes in Productivity Mine Sustainability Cultural and Environmental Impacts Health and Safety	Weekly Zoom Tutorial Session - Mine Development

Week 3 Introduction to Blasting - 18 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic

Introduction to Blasting	Reading in Week 3 Moodle Block Types of explosives Terminology Hazards and controls Detonation Energy density	Weekly Zoom Tutorial Session - Mining Methods **Assignment 1** Due: Week 3 Friday (22 Mar 2024) 11:00 pm AEST

Week 4 Blast Design and Monitoring - 25 Mar 2024

Module/Topic	Chapter	Events and Submissions/Topic
Blast Design and Monitoring	Reading in Week 4 Moodle Block Initiation design Priming Charging Fragmentation optimisation Blast Design Environmental effects of blasting	Weekly Zoom Tutorial Session - Mine Surveying

Week 5 Truck and Shovel Operations - 01 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Truck and Shovel Operations	Reading in Week 5 Moodle Block Trucks and Shovels Maintenance Fleet efficiency Frameworks for modelling open-pit mining operations.	Weekly Zoom Tutorial Session Session - Mine Planning

Vacation Week - Non Teaching Week - 08 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Vacation Week	Vacation Week	Vacation Week

Week 6 New Technologies - 15 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
New Technologies	Reading in Week 6 Moodle Block GPS, Drones, LiDAR, Digital Photography Equipment Sensors, Temp, Pressure, Vibration, GPS Environmental Sensors, Dust, Gasses, Images	Weekly Zoom Tutorial Session - Blast Design

Week 7 Sensors to Generate Mine Data - 22 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Sensors to Generate Mine Data	Reading in Week 7 Moodle Block Equipment Sensors, Temp, Pressure, Vibration, GPS Environmental Sensors, Dust, Gasses	Weekly Zoom Tutorial Session Session - Mine Ventilation

Week 8 Data Collection and Analysis - 29 Apr 2024

Module/Topic	Chapter	Events and Submissions/Topic
Data Collection and Analysis	Reading in Week 8 Moodle Block Big data analytics Artificial intelligence Machine Learning algorithms Modelling and prediction	Weekly Zoom Tutorial Session - Mining and the Environment **Assignment 2** Due: Week 8 Friday (3 May 2024) 11:00 pm AEST

Week 9 Optimising Mining Operations - 06 May 2024

Module/Topic	Chapter	Events and Submissions/Topic

Optimising Mining Operations	Reading in Week 9 Moodle Block Value Chain Frameworks for modelling open-pit mining operations. Minimising energy consumption Mine layout Mine planning	Weekly Zoom Tutorial Session - Health and Safety

Week 10 Automated Mining Methods - 13 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Automated Mining Methods	Reading in Week 10 Moodle Block Drilling and blasting Ground support Ore removal	Weekly Zoom Tutorial Session - Introduction to Mineral Processing

Week 11 Introduction to Ventilation - 20 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Introduction to Ventilation	Reading in Week 11 Moodle Block Terminology Mine ventilation Heat and air cooling power Dust and gases	Weekly Zoom Tutorial Session - Metallurgical Processing

Week 12 Mine Ventilation Design - 27 May 2024

Module/Topic	Chapter	Events and Submissions/Topic
Mine Ventilation Design	Reading in Week 12 Moodle Block The flow of air in ducts Ventilation pressure and air power Ventilation fans Ventilation networks	Weekly Zoom Tutorial Session - Hydrometallurgical Processing

Review/Exam Week - 03 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
No module or topic for review week.	No reading required.	**Assignment 3** Due: Review/Exam Week Wednesday (5 June 2024) 11:45 pm AEST

Exam Week - 10 Jun 2024

Module/Topic	Chapter	Events and Submissions/Topic
No module or topic for exam week. No exam.	No reading required.	No exam.

Assessment Tasks

1 Assignment 1

Assessment Type
Written Assessment

Task Description
This assessment will strengthen your understanding of the impact of technology on the social, environmental and economic aspects of Australian mining. Carefully review the material provided in Moodle and answer the questions in the assignment.
·Review the detailed assignment questions found in Moodle
·Review relevant literature, including textbooks and government websites, to understand the terminology, costs, processes and procedures associated with mining.
·Research recent scientific journal articles from the last three years
·Complete the assignment questions making effective use of the available resources
Submit the assignment electronically using Word, Excel and pdf documents, as required. Submit the assignment through

the assessment link on Moodle.
Note: All submissions are processed using the similarity detection software Turnitin. CQU values academic integrity. Cite and reference reliable sources using the Harvard Referencing Style Guide.

Assessment Due Date
Week 3 Friday (22 Mar 2024) 11:00 pm AEST

Submit electronically via Moodle with your name, unit code and assignment number i.e. NAME_ENAR12014_Assignment 1

Return Date to Students
Week 5 Friday (5 Apr 2024)

Assignments will be returned with feedback within two weeks.

Weighting
20%

Minimum mark or grade
45%

Assessment Criteria
Use clear, coherent sentences.
Where appropriate, include clearly labelled diagrams.
Ensure photographs, pictures and diagrams are correctly labelled, introduced and referred to within the answer's text.
Correctly cite and reference sources of information using the Harvard referencing style guide. Include a list of references at the end of the assignment.
Use mining terminology correctly.
Refer to assignment-specific assessment criteria listed in Moodle for further details.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Use Turnitin and Moodle to submit assignments.

Learning Outcomes Assessed

- Evaluate the impact of technology on sustainability, safety and productivity in Australian mining
- Investigate a data collection system for monitoring the performance of mining equipment

2 Assignment 2

Assessment Type
Written Assessment

Task Description
This assessment will strengthen the student's understanding of the technical aspects of blast design and truck and shovel operations.

- Carefully review the material provided in moodle and answer the questions detailed in the assignment.
- Review relevant literature, including Original Equipment Manufacturers (OEM) and government websites, to understand equipment capabilities, processes and procedures associated with blasting and truck and shovel operations.
- Research recent scientific journal articles from the last three years
- Complete the assignment questions making effective use of the available resources
- Review the detailed assignment questions found in Moodle

Submit the assignment electronically in Word, Excel and pdf documents. Submit the work through the assessment link on Moodle.
Note: All submissions are processed using the similarity detection software Turnitin. CQU values academic integrity. Cite and reference reliable sources using the Harvard Referencing Style Guide.

Assessment Due Date
Week 8 Friday (3 May 2024) 11:00 pm AEST

Submit electronically via Moodle with your name, unit code and assignment number i.e. NAME_ENAR12014_Assignment_2

Return Date to Students
Week 10 Monday (13 May 2024)

Assignments will be returned with feedback within two weeks.

Weighting
30%

Minimum mark or grade
45%

Assessment Criteria
Use clear, coherent sentences.
Where appropriate, include clearly labelled diagrams.
Ensure photographs, pictures and diagrams are correctly labelled, introduced and referred to within the answer's text.
Ensure formulae and workings are shown in sufficient detail to clearly explain how the answer was derived.
Answers should show correct units of measure, e.g. (m, MN, m^2, tonnes, m^3, ^oC, etc.).
Correctly cite and reference sources of information. Include a list of references at the end of the assignment.
Use mining terminology correctly.
Refer to assignment-specific assessment criteria listed in Moodle for further details.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Use Turnitin and Moodle to submit assignments.

Learning Outcomes Assessed

- Apply given parameters to develop a drill and blast pattern for a coal or metalliferous deposit in a surface mining operation

3 Assignment 3

Assessment Type
Report

Task Description
This assessment will strengthen student understanding of the technical aspects of sensors, data collection and analysis, automated mining methods, ventilation and mine optimisation. Carefully review the material provided in Moodle and answer the questions in the assignment.

- Review relevant literature, including textbooks, online material and government websites, to understand critical factors to be measured and addressed when improving mine productivity, safety and sustainability.
- Research recent and relevant scientific journal articles from the last three years.
- Complete the assignment questions making effective use of the available resources.

Submit the assignment electronically using Word, Excel and pdf documents. Submit the work through the assessment link on Moodle.
Note: All submissions are processed using the similarity detection software Turnitin. CQU values academic integrity. Cite and reference reliable sources using the Harvard Referencing Style Guide.

Assessment Due Date
Review/Exam Week Wednesday (5 June 2024) 11:45 pm AEST

Submit electronically via Moodle with your name, unit code and assignment number i.e. NAME_ENAR12014_Assignment_3

Return Date to Students

Assignments will be returned with feedback within two weeks.

Weighting
40%

Assessment Criteria
Use clear, coherent sentences.
Where appropriate, include clearly labelled diagrams.
Ensure photographs, pictures and diagrams are correctly labelled, introduced and referred to within the answer's text.
Ensure formulae and workings are shown in sufficient detail to clearly explain how the answer was derived.
Answers should show correct units of measure, e.g. (m, MN, m^2, tonnes, m^3, ^oC, etc.).
Correctly cite and reference sources of information. Include a list of references at the end of the assignment.
Use mining terminology correctly.
Refer to assignment-specific assessment criteria listed in Moodle for further details.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Use Turnitin and Moodle to submit assignments.

Learning Outcomes Assessed

- Optimise truck and shovel operations in relation to surface mine layouts using appropriate software

4 Learning Portfolio

Assessment Type
Portfolio

Task Description
The "Learning Portfolio" provides an opportunity to reflect on learning. The Learning Portfolio records any work and reading that is relevant to the learning outcomes detailed in the course profile. Record and demonstrate evidence of all of the learning outcomes detailed for this unit, particularly teamwork, cultural sensitivity and ethical values. The Learning Portfolio provides an opportunity to discuss learning experiences online. It is also a record of websites, texts and journal articles that may be useful for future reference.
There are three sections to the Learning Portfolio:
1. Study Diary
2. Learning Reflections
3. Interactions
This assessment does not require a high-quality presentation. It just needs to demonstrate evidence of work undertaken towards weekly completion of the unit.

Assessment Due Date

An updated version of your learning portfolio will be submitted electronically via Moodle with assignment 1 in week 3, assignment 2 in week 7 and assignment 3 in Review/Exam week. Include your name, unit code and assignment number i.e. NAME_ENAR12014_Learning_Portfolio_AssignmentNumber

Return Date to Students

Learning Portfolio feedback will be returned within two weeks of submission.

Weighting
10%

Assessment Criteria
The learning portfolio will contain,
a) regular weekly updates from week 1 to week 12,
b) evidence of research and reading beyond the course material,
c) mapping of course and learning material to the learning outcomes,
d) evidence of interactions with academic staff, peers, or work colleagues related to this unit.
An updated version of the learning portfolio will be submitted with each assignment.

Referencing Style

- Harvard (author-date)

Submission
Online

Submission Instructions
Turnitin will be used to check submissions. Avoid academic integrity issues. Use the link in moodle to submit assignments.

Learning Outcomes Assessed

- Collaborate and communicate with lecturers and peers through the use of forums, learning journals and online tutorials.

Academic Integrity Statement

As a CQUniversity student you are expected to act honestly in all aspects of your academic work.

Any assessable work undertaken or submitted for review or assessment must be your own work. Assessable work is any type of work you do to meet the assessment requirements in the unit, including draft work submitted for review and feedback and final work to be assessed.

When you use the ideas, words or data of others in your assessment, you must thoroughly and clearly acknowledge the source of this information by using the correct referencing style for your unit. Using others' work without proper acknowledgement may be considered a form of intellectual dishonesty.

Participating honestly, respectfully, responsibly, and fairly in your university study ensures the CQUniversity qualification you earn will be valued as a true indication of your individual academic achievement and will continue to receive the respect and recognition it deserves.

As a student, you are responsible for reading and following CQUniversity's policies, including the **Student Academic Integrity Policy and Procedure**. This policy sets out CQUniversity's expectations of you to act with integrity, examples of academic integrity breaches to avoid, the processes used to address alleged breaches of academic integrity, and potential penalties.

What is a breach of academic integrity?
A breach of academic integrity includes but is not limited to plagiarism, self-plagiarism, collusion, cheating, contract cheating, and academic misconduct. The Student Academic Integrity Policy and Procedure defines what these terms mean and gives examples.

Why is academic integrity important?
A breach of academic integrity may result in one or more penalties, including suspension or even expulsion from the University. It can also have negative implications for student visas and future enrolment at CQUniversity or elsewhere. Students who engage in contract cheating also risk being blackmailed by contract cheating services.

Where can I get assistance?
For academic advice and guidance, the Academic Learning Centre (ALC) can support you in becoming confident in completing assessments with integrity and of high standard.

What can you do to act with integrity?

Be Honest
If your assessment task is done by someone else, it would be dishonest of you to claim it as your own

Seek Help
If you are not sure about how to cite or reference in essays, reports etc, then seek help from your lecturer, the library or the Academic Learning Centre (ALC)

Produce Original Work
Originality comes from your ability to read widely, think critically, and apply your gained knowledge to address a question or problem