MINE3430
MINING SYSTEMS

COURSE OUTLINE

SEMESTER 1, 2014
GENERAL COURSE INFORMATION

Course Title: Mining Systems

Semesters Offered: Semester 1

Level: Undergraduate

Number of Units/Credits: 6 (UNSW)

Contact Hours per Week

4 contact hours to be utilised for lectures and tutorials.

Contact times are scheduled for
  • Tuesday 2 PM – 4 PM: BioMed C.
  • Thursday 1 PM – 3 PM: OMB230.

For up to date information on lectures and workshops, see the Course Calendar in Moodle.

Learning & Teaching Management System (LTMS): The Learning & Teaching Management System (LTMS) used with this course is Moodle which can be accessed at http://elearning.mea.edu.au.

For up to date information on lectures see the Calendar section in LTMS.

Support material for this course including, copies of lecture notes, recommended readings, assignments and results for assignments etc whenever available can be found in LTMS.

All correspondence should be undertaken using the email facility within LTMS. Changes in the lecture schedule, seminars, workshops and assignment dates will be posted on the Calendar in LTMS.

It is important that students regularly check LTMS for changes in calendar events and for email messages. It is strongly recommended that students use the mail redirection facility to forward LTMS emails to their usual email address.
Assessment
Assessments will take the form of two quizzes and one final exam.
NOTE:
- Course completion requires all assessment items be completed otherwise a student can be awarded a grade of Unsatisfactory Fail.
- Students must attend at least 80% of course lectures in order for their mark in the formal exam to be counted towards their overall course mark.

Course Convenor

Rudrajit Mitra. Rm 159K, Old Main Building. Phone: 9385 5161. Email: r.mitra@unsw.edu.au

Course Description

This course provides an overview of the principles and application of the major underground and surface mining methods and equipment, and the conceptual design of the major materials handling and transport systems and support infrastructure.

Assumed Background

This course assumes that students have a good understanding of mining terms and descriptions, have been exposed to surface and underground mining methods and are familiar with mining development, operations and production.
COURSE CONTENT

Introduction to Systems Engineering

Systems infrastructure and site requirements
- Mine services
  - Water, air, rail, roads etc
  - Electrical
  - Hydraulics
- Mine development
  - Access (Shaft, declines)
  - Surface infrastructure (offices, fuel storage bays etc)

Surface mining methods
- Method selection
- Strip mining
- Highwall mining
- Open pit mining
  - Includes truck and shovel (coal)
  - Includes extractives
- Quarry mining
- Other mining methods

Underground mining methods
- Method selection
- Mine development
- Coal mining
  - History of Australian coal mining
  - Bord and pillar, Longwall
  - Ventilation, Pillar design, gas, outburst, windblast, spontaneous combustion, etc.
  - Working in difficult ground
- Ground control – hard rock
- Backfill
- Raising
- Hard rock mining methods
  - Sublevel (open) stoping
  - Benching
  - Cut and fill
  - Caving methods
  - Room and pillar
Aims, Learning Outcomes & Graduate Attributes

Course Aims

This course provides an overview of the principles and application of the major underground and surface mining methods and equipment, and the conceptual design of the major materials handling and transport systems and support infrastructure. Specific topics to be covered include:

- Systems infrastructure and site requirements.
- Surface mining methods
- Underground mining methods

Learning Outcomes

It is intended that students will be able to:

- Describe and illustrate major mining methods and related equipment and support infrastructure
- Identify, assess and select mining systems appropriate to specific types of deposits
- Conduct productivity analysis for selected mining system(s)
- Appraise mining systems with respect to safe, efficient, economic and environmentally and socially responsible operations
- Identify and evaluate core risks in each mining system
- Demonstrate awareness of major technological trends.

Graduate Attributes

This course will contribute to the development of the following Graduate Attributes:

- Appropriate technical knowledge
- Having advanced problem solving, analysis and synthesis skills with the ability to tolerate ambiguity
- Ability for engineering design and creativity
- Being able to think and work individually and in teams
- Having HSEC consciousness
RECOMMENDED TEXTS AND RESOURCES

Recommended Texts
- SME Mining Engineers Handbook, 1992. USA

Reference Texts

Online and Other Resources

Selected readings as well as other supporting material (e.g. course outline and lecture notes will be made available on Moodle, the Learning & Teaching Management System (LTMS) accessed on-line at http://elearning.mea.edu.au/)
# Learning Activities and Methods

## Learning Activities Summary

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Activity</th>
<th>Hours</th>
<th>Area</th>
<th>Content</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>04/03</td>
<td>Lecture</td>
<td>2</td>
<td>Generic/ Surface</td>
<td>L1. Course Introduction&lt;br&gt; L2. Introduction to Systems Engineering&lt;br&gt; L3. Mine Services (Water, air, rail, roads, electrical, hydraulics)&lt;br&gt; L4. Surface Infrastructure and Mine Development (Decline, Shaft, etc)</td>
<td>RM/FR</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Infrastructure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>06/03</td>
<td>Lecture</td>
<td>2</td>
<td>Surface Mining</td>
<td>L1. Introduction - Surface vs Underground Mining - Method Selection&lt;br&gt; L2. Drilling &amp; Blasting</td>
<td>FR</td>
</tr>
<tr>
<td></td>
<td>13/03</td>
<td>Tutorial</td>
<td>2</td>
<td></td>
<td>Tutorial 1 – Mine Services &amp; Infrastructure</td>
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<tr>
<td></td>
<td>20/03</td>
<td>Tutorial</td>
<td>2</td>
<td></td>
<td>Tutorial 2 – Strip Mining – Dragline</td>
<td></td>
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<tr>
<td></td>
<td>27/03</td>
<td>Tutorial</td>
<td>2</td>
<td></td>
<td>Tutorial 3- Open Pit/Highwall Mining (optional)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>01/04</td>
<td>Lecture</td>
<td>2</td>
<td>Surface Mining</td>
<td>L10. Quarrying&lt;br&gt; L11. Other Mining Methods (Placer, Hydraulic, Dredging, etc.)</td>
<td>FR</td>
</tr>
<tr>
<td></td>
<td>03/04</td>
<td>Tutorial</td>
<td>2</td>
<td></td>
<td>Tutorial 4- Truck &amp; Shovel Operations</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>08/04</td>
<td>Lecture</td>
<td>2</td>
<td>Surface Mining</td>
<td>Tutorial 5 – Talpac</td>
<td>FR</td>
</tr>
<tr>
<td></td>
<td>10/04</td>
<td>Lecture</td>
<td>1</td>
<td></td>
<td>A1. Quiz 1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>14/04 - 17/04</td>
<td>NON-TEACHING WEEK</td>
<td></td>
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<tr>
<td></td>
<td>18/04 - 25/04</td>
<td>MID-SESSION BREAK</td>
<td></td>
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<tr>
<td>8</td>
<td>28/04</td>
<td>Lecture</td>
<td>1</td>
<td>Underground Coal Mining</td>
<td>L1. Introduction – Underground Coal Mining&lt;br&gt; L2. Mine Development (Portals, Mains, Headings, Eq.)</td>
<td>RM</td>
</tr>
<tr>
<td></td>
<td>01/05</td>
<td>Tutorial</td>
<td>2</td>
<td>Underground Coal Mining</td>
<td>L3. Bord and Pillar&lt;br&gt; L4. Longwall Mining</td>
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</tr>
<tr>
<td>9</td>
<td>06/05</td>
<td>Lecture</td>
<td>2</td>
<td>Underground Coal Mining</td>
<td>Tutorial 6- Longwall mining</td>
<td>RM</td>
</tr>
<tr>
<td></td>
<td>08/05</td>
<td>Tutorial</td>
<td>2</td>
<td>Underground Coal Mining</td>
<td>L5. Thick seam mining&lt;br&gt; L6. Underground coal operational issues</td>
<td>BH</td>
</tr>
<tr>
<td>10</td>
<td>13/05</td>
<td>Lecture</td>
<td>2</td>
<td>Underground Coal Mining</td>
<td>L1. Introduction - Metal Mining (Method selection, design specs, RMR, Ventilation, etc)&lt;br&gt; L2. Mine development</td>
<td>FS</td>
</tr>
<tr>
<td></td>
<td>15/05</td>
<td>Tutorial</td>
<td>2</td>
<td>Underground Coal Mining</td>
<td>Tutorial 7- Mine Development (Shaft vs Decline)</td>
<td>RM</td>
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<tr>
<td></td>
<td>22/05</td>
<td>Tutorial</td>
<td></td>
<td>Underground Metal Mining</td>
<td>Tutorial 8 – UBC Mining Method Selection</td>
<td>RM</td>
</tr>
<tr>
<td>12</td>
<td>27/05</td>
<td>Lecture</td>
<td>4</td>
<td>Underground Metal Mining</td>
<td>L6. Sublevel Caving&lt;br&gt; L7. Block Caving&lt;br&gt; L8. Other Methods (VCR, Shrink Stoping)</td>
<td>FS</td>
</tr>
<tr>
<td></td>
<td>29/05</td>
<td>Tutorial</td>
<td></td>
<td>Underground Metal Mining</td>
<td>Tutorial 9- Room &amp; Pillar / Cut &amp; Fill</td>
<td>RM</td>
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</tbody>
</table>
**VR sessions (1 hour)** will be held for Truck and Shovel and for Underground Coal Mining throughout the semester. Details will be mentioned in class.

### Assessment of Learning Outcomes

<table>
<thead>
<tr>
<th>Learning Outcomes</th>
<th>Assessment Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Describe and illustrate major mining methods and related equipment and support infrastructure</td>
<td>• Quizzes&lt;br&gt;• Tutorials&lt;br&gt;• Exam</td>
</tr>
<tr>
<td>2. Identify, assess and select mining systems appropriate to specific types of deposits</td>
<td>• Quizzes&lt;br&gt;• Tutorials&lt;br&gt;• Exam</td>
</tr>
<tr>
<td>3. Conduct productivity analysis for selected mining system(s)</td>
<td>• Quizzes&lt;br&gt;• Tutorials&lt;br&gt;• Exam</td>
</tr>
<tr>
<td>4. Appraise mining systems with respect to safe, efficient, economic and environmentally and socially responsible operations</td>
<td>• Quizzes&lt;br&gt;• Tutorials&lt;br&gt;• Exam</td>
</tr>
<tr>
<td>5. Identify and evaluate core risks in each mining method</td>
<td>• Quizzes&lt;br&gt;• Tutorials&lt;br&gt;• Exam</td>
</tr>
<tr>
<td>6. Demonstrate awareness of major technological trends.</td>
<td>• Quizzes&lt;br&gt;• Tutorials</td>
</tr>
</tbody>
</table>
Teaching & Learning Methods

1. Lectures and tutorials: This course will have weekly traditional lectures along with tutorials to supplement the learning. The tutorials will be held in class and have to be submitted on the same day. They will be collected and marks will be provided at the end of the semester. Discussion on the tutorials will be held at the start of class on the next tutorial session.
Assessment Summary

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Start</th>
<th>Due</th>
<th>Weighting</th>
<th>Method of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz 1</td>
<td>Wk 6</td>
<td>Wk 6 (April 10)</td>
<td>20%</td>
<td>Surface Mining Systems</td>
</tr>
<tr>
<td>Quiz 2</td>
<td>Wk 13</td>
<td>Wk 13 (June 5)</td>
<td>20%</td>
<td>Underground Mining Systems</td>
</tr>
<tr>
<td>Tutorial</td>
<td>On the same day of each session</td>
<td>20%</td>
<td>End of the semester exam covering the whole course</td>
<td></td>
</tr>
<tr>
<td>Final Exam</td>
<td>June 16, 2014 (2 PM)</td>
<td>40%</td>
<td>End of the semester exam covering the whole course</td>
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</tr>
</tbody>
</table>

Tutorial Portfolio

Students need to submit their worked tutorials at the end of each session. Each submission will be added to their individual portfolio. Marking of the tutorials will be based on the completeness of the portfolio. The first 15 minutes of each tutorial will be used to discuss the previous tutorial’s solution. Solutions of each tutorial will be given to students a week later and not on the same day.

The portfolio will be worth 20% of the total course marks and will be assigned at the end of the due date.
UNIVERSITY POLICIES

Assignment Submissions

All assignments submitted for assessment in this course must be made in accordance with the School Policy on Assignment Submissions, hereafter in this subsection termed the Policy. Details of the Policy can be found in the School Policies section of the School webpage at http://www.engineering.unsw.edu.au/mining-engineering/assignment-submission-policy.

Students are required to read the latest version of the Policy and be aware of the various requirements including submission requirements and academic integrity. Failure to adhere to the requirement and/or submit an assignment that is fully compliant with the Policy may result in forfeiture by the student of all marks for that assignment.

An Assignment Coversheet must be attached to each assignment submitted for assessment whether the assignment is submitted in electronic or hardcopy form. The coversheet identifies the student, assignment, course and contains a declaration of academic integrity – see later section on Academic Honesty and Plagiarism. Assignments not containing a fully completed copy of the official coversheet for the assignment will be deemed non-compliant and not marked resulting in the student will be awarded zero marks for the assignment.

By default all assignments for courses in the School must be submitted as an electronic document. The submission requirements for electronic submissions are detailed in the Policy.

In the case where a hardcopy submission of an assignment has been permitted in the assignment briefing document then the submission requirements for hardcopy submissions as detailed in the Policy must be followed. The student must attach to the front of the assignment a completed and signed copy of the Assignment Coversheet.

Students are advised to retain a copy of every assignment submitted for assessment for their own record either in hardcopy or electronic form. From time to time assignments may be mislaid and a student can be asked to re-submit.

Group Work – Peer Assessment

Group work is a key Graduate Attribute in the Mining Engineering program. As such it is integrated into the assessment activities of many courses to determine whether a student has satisfactorily attained one or more of the Learning Outcomes.

An important indicator of a student’s performance and of their contribution to the group’s overall performance is reflected in the results of a formalised system of peer review. The Course Convenor uses these results and other factors in their determination of an individual student’s result for the assignment.

For further details see Peer Assessment in the School Policies section at

Students should be aware that participation in the peer review process is compulsory and that failure to do so can result in withholding of marks and/or zero marks being allotted to the student for that assignment.

**Late Submission of an Assignment**

In the normal course of events **late submission of an assignment will automatically result in a zero mark being awarded to the student/project team for the assignment.**

The onus is on the student to ensure each course assignment is submitted on-time during normal business hours and no later than the required time on the due date as stated in the relevant assignment briefing document.

For further details see Late Submissions in the School Policies section on the School webpage at http://www.engineering.unsw.edu.au/mining-engineering/late-submissions. See also the later section on Adverse Performance – Special Consideration.

**Course Results**

For details on assessment policy, assessment process and an explanation of course results, see the Assessment Policy section in the School Policies section on the School webpage at www.mining.unsw.edu.au/information-about/our-school/policies-procedures-guidelines.

In some instances a student’s final course result may be withheld and not released on the usual date. This is indicated by a course grade result of either:

- **WD** – which usually indicates that the student has not completed one or more items of assessment or there is an issue with one or more assignment; or
- **WC** – which indicates the student has applied for Special Consideration due to illness or misadventure and the course results have not been finalised.

In either event the onus is on the student to contact the Course Convenor as soon as practicable but **no later than five (5) days** after release of the course result. Failure to take this action will normally result in forfeiture of any additional assessment granted to the student. In which case the student may be required to resubmit an assignment or re-sit the final exam. Failure to contact the Course Convenor within the stated period may result in the student failing the course.

If contact has not been made and/or course assessment has not been finalised by commencement of the following academic semester then the grade will be automatically altered to a course grade of **NC** (course not completed) in Week 2. This will require the student to re-enrol in the course at some later time.

For details on assessment policy, assessment process and an explanation of course results, see the Assessment Policy at https://my.unsw.edu.au/student/academiclife/assessment/AssessmentatUNSW.html.
Adverse Performance – Special Consideration

In cases of illness or other extenuating circumstances that may have adversely impacted on a student’s performance in a course, it is recommended the student apply to Student Central for Special Consideration.

It is incumbent on the student to contact the Course Convenor immediately following lodgement and acceptance of the Special Consideration preferably in person and no later than one week from lodgement. Failure to make contact can result in forfeiture for any consideration and subsequent finalisation of the mark for the assignment and/or course.

Only following acceptance and official notification from the University, will any decision be made by the Course Convenor as to an appropriate response based the circumstances outlined by the student.

For further information, see Special Consideration policy at https://my.unsw.edu.au/student/atoz/SpecialConsideration.html.

Academic Honesty and Plagiarism

The University has certain expectations in terms of academic behaviour related to study and research. This is expressed in the University Policy on Academic Misconduct. Students should be aware of and understand this Policy. For further information, see Plagiarism and Academic Integrity policy at https://student.unsw.edu.au/plagiarism.

Plagiarism is one form of Academic Misconduct. It is the presentation of the thoughts or work of another as one’s own. Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person’s assignment without appropriate acknowledgement;
- paraphrasing another person’s work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.

1 Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

2 Adapted with kind permission from the University of Melbourne.
Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre at the University provides academic support services to students. Details about The Learning Centre is available at www.lc.unsw.edu.au.

It provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

In line with this university expectation, a student must attach to each assignment a fully completed official coversheet which contains a declaration of academic integrity. The following is an extract from an assignment coversheet.

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Extract from an Assignment Coversheet

**ACADEMIC REQUIREMENTS**

Before submitting this assignment, students are advised to review:

- the assessment requirements contained in the briefing document for the assignment;
- the various matters related to assessment in the relevant Course Outline; and
- the Plagiarism and Academic Integrity website at <http://www.lc.unsw.edu.au/plagiarism/pintro.html> to ensure they are familiar with the requirements to provide appropriate acknowledgement of source materials.

If after reviewing this material there is any doubt about assessment requirements then in the first instance the student should consult with the Course Convenor and then if necessary with the Director – Undergraduate Studies.

While students are generally encouraged to work with other students to enhance learning, all assignments submitted for assessment by a student must be their own work and they may be required to explain any or all parts of the assignment to the Course Convenor or other authorised persons. **Collusion** is where another person(s) assists in the preparation of an assignment without the consent or knowledge of the Course Convenor.

Plagiarism and Collusion are considered as Academic Misconduct and will be dealt with according to University Policy.
STUDENT DECLARATION OF ACADEMIC INTEGRITY
I declare that:

- This assessment item is entirely my own original work, except where I have acknowledged use of source material [such as books, journal articles, other published material, the Internet, and the work of other student/s or any other person/s].
- This assessment item has not been submitted for assessment for academic credit in this, or any other course, at UNSW or elsewhere.

I understand that:

- The assessor of this assessment item may, for the purpose of assessing this item, reproduce this assessment item and provide a copy to another member of the University.
- The assessor may communicate a copy of this assessment item to a plagiarism checking service (which may then retain a copy of the assessment item on its database for the purpose of future plagiarism checking).

Continual Course Improvement
Periodically the process of course evaluation is undertaken. One aspect of this evaluation is feedback from students gathered by various means including:

- UNSW's Course and Teaching Evaluation and Improvement (CATEI) which is an anonymous, on-line survey system.

Student feedback is taken seriously, and continual improvements are made to the course based in part on such feedback.

Significant changes that are made to a course as a result of such student feedback will be communicated to students by the Course Convenor at commencement of semester when the course is next run.

Correspondence and Email Messages
University policy states that official correspondence with a student will be made using the university provided email address and that it expects students will regularly check their official university email account. The School assists in this by providing free access to computing facilities and the internet.

In line with this policy, messages will be sent to students through their LTMS account. Students can retrieve messages from the mailbox in each LTMS course account.

Administrative Matters
Students should ensure they are familiar with the various policies related to expectations of students. Links to the Policies can be found on the School web page at www.mining.unsw.edu.au/information-about/our-school/policies-procedures-guidelines.

Equity and diversity: those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (www.equity.unsw.edu.au/disabil.htm).
Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made. Information on designing courses and course outlines that take into account the needs of students with disabilities can be found at www.secretariat.unsw.edu.au/acboardcom/minutes/coe/disabilityguidelines.pdf.