



Faculty of Engineering

School of Minerals and Energy Resources Engineering

Undergraduate Course Outline

MINE3220

Resource Estimation

Mr Jon Barber

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1. INFORMATION ABOUT THE COURSE

Course Code:	MINE3220	Term:	T1, 2020	Level:	UG	Units/Credits	6 UOC
Course Name:	Resource Estimation						

Course Convenor:	Mr Jon Barber		
Contact Details	School of Minerals and Energy Resources Engineering OMB,	EMAIL:	j.barber@unsw.edu.au
		Phone:	0412 163460
Contact times	Lecture time schedule Wednesday, 10:00am-12:00pm, Goldstein G07 (K-D16-G07) Thursday, 9:00am-11:00am, Quadrangle G040 (K-E15-G040)		

1.1. Course Description

Resource and reserve estimation of coal and metalliferous deposits. Geological influences on resource and reserve estimation. Basic resource/reserve reporting with particular reference to the JORC code. Orebody and block modelling. Mine planning process and roles of feasibility studies. Mining economics and business framework. Fundamental financial concepts for mining operations.

This course covers the following topics:

- Data collection, compositing and resource model
- Principles of resource and reserve estimation
- Resource estimation techniques
- Orebody modelling covering 2D and 3D modelling.
- JORC Code
- Mine planning process
- Roles of feasibility studies
- Fundamental financial concepts for mining operations
- Mining business framework

1.2. Course Completion

Course completion requires:

- submission of **all assessment items**; failure to submit all assessment items will result in the award of an Unsatisfactory Failure (UF) grade for the Course.
- attendance at guest industry presentations
- participation in software training

1.3. Assumed Knowledge

This course assumes that a student:

- is currently enrolled in the Mining Engineering single degree program or a Mining Engineering double degree program at UNSW; and
- has satisfactorily completed all the courses in Stages 1 to 2 of the Mining Engineering single degree program or equivalent in the Mining Engineering double degree program and is in the Stage/Year of the program; and
- a basic knowledge of mining, geology and statistics.

1.4. Attendance

To pass this course it is expected that you will attend at least 80% of tutorials and lectures. *If your attendance is below 80% you will not be admitted to the final exam.* Attendance will be recorded when applicable. Normally, there is no make-up work for poor attendance. If you have misadventure or ill-health, please contact your course coordinator soon as possible. The attendance requirement is not meant to be punitive. It is included because participation is an important part of achieving the course outcomes.

2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

2.1. Course Aims

The aim of this course is to introduce students to the principles of resource and reserve estimation for metalliferous and coal deposits, as well as the fundamental concepts of mine planning process.

2.2. Learning Outcomes

Resource estimation is intended to enable students to:

- Appreciate the mine planning process and the impact of the economic environment on mining
- Appreciate the role of feasibility studies in mine planning
- Create coal and metalliferous resource models from exploration datasets using appropriate software tools and various estimation techniques
- Evaluate the merits and drawbacks of various estimation methods relevant to specific mineral deposit types
- Report resources and reserves using the JORC code
- Demonstrate an appreciation of the time value of money, discount rates, commodity markets, the required rate of return to equity
- Explain the unique characteristics of mining and their implications for mine economics

2.3. 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 cope with ambiguity and geological uncertainty
- Being able to think and work individually and in teams

3. REFERENCE RESOURCES

3.1. Reference Materials

Support material for this course including, whenever available, course reader, lecture and tutorial materials, recommended readings, assignments and results for assignments etc can be found on Moodle. All correspondence with students and any information regarding changes in the lecture schedule and assignment dates will be done through Moodle. All assignments must be submitted through Moodle. It is important that students regularly check Moodle for changes in calendar events and for messages. The lecture note may be viewed and downloaded from the UNSW-Moodle <http://moodle.telt.unsw.edu.au/>.

3.2. Text (if applicable)

- SME Mining Engineers Handbook, 1992. USA
- Course reader (available on Moodle)
- Camus J. Management of Mineral Resources (available in UNSW library)
- Lecture slides and supporting readings (available on Moodle)

3.3. Other Resources (if applicable)

- The Learning Centre. A number of resources are available at the UNSW Learning Centre website to assist students in preparing the various assessment tasks including:
- *MEA Report Writing Guide for Mining Engineers*. P Hagan and P Mort (Mining Education Australia (MEA)). (Latest edition available for download from the School website or a hardcopy version is available from the UNSW Bookshop)
- Surfer 8
- Microsoft Excel
- Geostatistics for Windows / Vulcan / Datamine

Videos are often provided to students as a web stream within the Moodle learning management system. Videos are not available for download by students, unless approved by the Course Convenor and either the Undergraduate or Postgraduate Coursework Director. Special consideration can be provided for students to access videos off-line (eg. working remotely). Note that UNSW reserves the right to deliver videos as a web stream rather than off-line and cannot provide videos that are copyright from other providers.

3.4. *Guide to Authors*. (Australasian Institute of Mining and Metallurgy: Melbourne) (Available for download from the AusIMM website) Online Resources

3.5. Report Writing Guide

The School has a report writing guide (RWG) available. A copy of this is available on the course Moodle site.

4. COURSE CONTENT AND LEARNING ACTIVITIES

Week	Date	Topics	Presenter
1	19 Feb	Introduction, Data Collection and Sampling Theory	HLR
1	20 Feb	Data Compositing	HLR
2	26 Feb	Orebody modelling, Global resource estimation	JB
2	27 Feb	JORC 2012	JB
2	28 Feb	Vulcan training (all day)	MW
3	4 Mar	Mine Planning Process, Business Framework, Role of Feasibility Studies	JB
3	5 Mar	Resource estimation techniques	JB
4	11 Mar	Tutorial	JB
4	12 Mar	Surfer training	HLR
5	18 Mar	Quiz 1	JB
5	19 Mar	Project Working	
5	20 Mar	Vulcan training	MH
6	25 Mar	Geostatistics	JB
6	26 Mar	Geostatistics & Quiz 2	JB
7	1 Apr	JORC from an industry perspective	Kerry Whitby
7	2 Apr	Financial Concepts	JB
7	3 Apr	Project 1 due on Moodle upload by 12 noon	
8	8 Apr	Quiz 3	JB
8	9 Apr	Cost Estimation, Mining Economics	JB
9	15 Apr	Project 2 progress interview	Tim (PhD)
9	16 Apr	Mine Planning from an industry perspective	Ben Smedley
10	22 Apr	Project finalising time (student group work)	
10	23 Apr	Course review	JB
10	24 Apr	Project 2 due on Moodle Upload by 12 noon	

Other UNSW Key dates: <https://student.unsw.edu.au/new-calendar-dates>

5. COURSE ASSESSMENT

5.1. Assessment Summary

Assessment	Start	Due	Weighting
Quiz 1 (written in class)	Week 5	Week 5	10%
Project 1 – individual	Week 2	Week 7	15%
Quiz 2 (written in class)	Week 8	Week 8	10%
Quiz 3 (written in class)	Week 9	Week 9	10%
Project 2 - group	Week 2	Week 11	15%
Final Exam	Exam Period		40%
TOTAL			100%

Assignments related details/submission-box will be available online through Moodle. Access to the Moodle site is via the Moodle icon on the MyUNSW homepage.

6. ASSESSMENT CRITERIA

The assessment criteria provide a framework for you to assess your own work before formally submitting major assignments to your course convenor. Your course convenor will be using this framework to assess your work and as a way to assess whether you have met the listed learning outcomes and the graduate attributes for your program. We ask that you don't use the assessment criteria guidelines as a checklist, but as a tool to assess the quality of your work. Your course convenor will also be looking at the quality, creativity and the presentation of your written assignment as they review the framework. Rubrics, wherever applicable, will be provided at the time of the assignment release.

8. STUDYING A UG COURSE IN UNSW MINERALS AND ENERGY RESOURCES ENGINEERING

9.1. How We Contact You

At times, the School or your course convenors may need to contact you about your course or your enrolment. Your course convenors will use the email function within Moodle or we will contact you on your @student.unsw.edu.au email address.

We understand that you may have an existing email account and would prefer for your UNSW emails to be redirected to your preferred account. Please see these instructions on how to redirect your UNSW emails: <https://www.it.unsw.edu.au/students/email/index.html>

9.2. How You Can Contact Us

We are always ready to assist you with your inquiries. To ensure your question is directed to the correct person, please use the email address below for:

Enrolment or other admin questions regarding your program:
<https://unswinsight.microsoftcrmportals.com/web-forms/>

Course inquiries: these should be directed to the Course Convenor.

9.3. Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System).

It is essential that you have access to a PC or notebook computer. Mobile devices such as smart phones and tablets may compliment learning, but access to a PC or notebook computer is also required. Note that some specialist engineering software is not available for Mac computers.

Mining Engineering Students: OMB G48/49

Petroleum Engineering Students: TETB

It is recommended that you have regular internet access to participate in forum discussion and group work. To run Moodle most effectively, you should have:

- broadband connection (256 kbit/sec or faster)
- ability to view streaming video (high or low definition UNSW TV options)

More information about system requirements is available at www.student.unsw.edu.au/moodle-system-requirements

9.4. Accessing Course Materials Through Moodle

Course outlines, support materials are uploaded to Moodle, the university standard Learning Management System (LMS). In addition, on-line assignment submissions are made using the assignment dropbox facility provided in Moodle. All enrolled students are automatically included in Moodle for each course. To access these documents and other course resources, please visit:

www.moodle.telt.unsw.edu.au

9.5. Assignment Submissions

The School has developed a guideline to help you when submitting a course assignment.

We encourage you to retain a copy of every assignment submitted for assessment for your own record either in hardcopy or electronic form.

All assessments must have an assessment cover sheet attached.

9.6. Late Submission of an Assignment

Full marks for an assignment are only possible when an assignment is received by the due date.

We understand that at times you may not be able to submit an assignment on time, and the School will accommodate any fair and reasonable extension. We would recommend you review the UNSW Special Consideration guidelines – see following section.

Full marks for an assignment are only possible when an assignment is received by the due date. In fairness to those students who do meet the assignment due date and time, deductions will apply to submissions made after this time. Penalty marks will be applied at the following rate if submitted after

the due date: five (5) percentile points of the maximum possible mark for each day or part thereof that the assessment is overdue.

For example, if a student submitted the Project Progress Report five days after the due date and the unadjusted mark was 68% then the final adjustment mark for the assignment would be 43%; that is the raw mark of 68% less 25 percentile points (5 days @ 5 percentile points per day).

9.7. Special Consideration

You can apply for special consideration through [UNSW Student Central](#) when illness or other circumstances interfere with your assessment performance.

Sickness, misadventure or other circumstances beyond your control may:

- Prevent you from completing a course requirement,
- Keep you from attending an assessable activity,
- Stop you submitting assessable work for a course,
- Significantly affect your performance in assessable work, be it a formal end-of-semester examination, a class test, a laboratory test, a seminar presentation or any other form of assessment.

We ask that you please contact the Course Convenor immediately once you have completed the special consideration application, no later than one week from submission.

More details on special consideration can be found at:

www.student.unsw.edu.au/special-consideration

9.8. Course Results

For details on UNSW assessment policy, please visit: www.student.unsw.edu.au/assessment

In some instances, your final course result may be withheld and not released on the UNSW planned date. This is indicated by a course grade result of either:

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

In either event it would be your responsibility to contact the Course Convener as soon as practicable but no later than five (5) days after release of the course result. If you don't contact the convener on time, you may be required to re-submit an assignment or re-sit the final exam and may result in you failing the course. You would also have a NC (course not completed) mark on your transcript and would need to re-enroll in the

course.

9.9. Students Needing Additional Support

The Student Equity and Disabilities Unit (SEADU) aims to provide all students with support and professional advice when circumstances may prevent students from achieving a successful university education. Take a look at their webpage:

www.studentequity.unsw.edu.au/

9.10. Academic Honesty and Plagiarism

Your lecturer and the University will expect your submitted assignments are truly your own work. UNSW has very clear guidelines on what plagiarism is and how to avoid it. Plagiarism is using the words or ideas

of others and presenting them as your own. Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. The University has adopted an educative approach to plagiarism and has developed a range of resources to support students. All the details on plagiarism, including some useful resources, can be found at www.student.unsw.edu.au/plagiarism.

All Mining Engineering students are required to complete a student declaration for academic integrity which is outlined in the assignment cover sheets. By signing this declaration, you agree that your work is your own original work.

If you need some additional support with your writing skills, please contact the Learning Centre or view some of the resources on their website: www.lc.unsw.edu.au/. The Learning Centre is designed to help you improve your academic writing and communication skills. Some students use the Centre services because they are finding their assignments a challenge, others because they want to improve an already successful academic performance.

9.11. Continual Course Improvement

At the end of each course, all students will have the opportunity to complete a course evaluation form. These anonymous surveys help us understand your views of the course, your lecturers and the course materials. We are continuously improving our courses based on student feedback, and your perspective is valuable.

Feedback is given via <https://student.unsw.edu.au/myexperience> and you will be notified when this is available for you to complete.

We also encourage all students to share any feedback they have any time during the course – if you have a concern, please contact us immediately.



School of Minerals and Energy Resources Engineering

Assessment Cover Sheet

Course Convenor: _____
 Course Code: _____ Course Title: _____
 Assignment: _____
 Due Date: _____
 Student Name: _____ Student ID: _____

ACADEMIC REQUIREMENTS

Before submitting this assignment, the student is 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 must be their entire own work and duly acknowledge the use of other person's work or material. The student may be required to explain any or all parts of the assignment to the Course Convenor or other authorised persons. *Plagiarism* is using the work of others in whole or part without appropriate acknowledgement within the assignment in the required form. *Collusion* is where another person(s) assists in the preparation of a student's 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).

Student Signature: _____

Date: _____

Students are advised to retain a copy of this assessment for their records and submission should be made in accordance to the assessment details available on the course Moodle site.

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