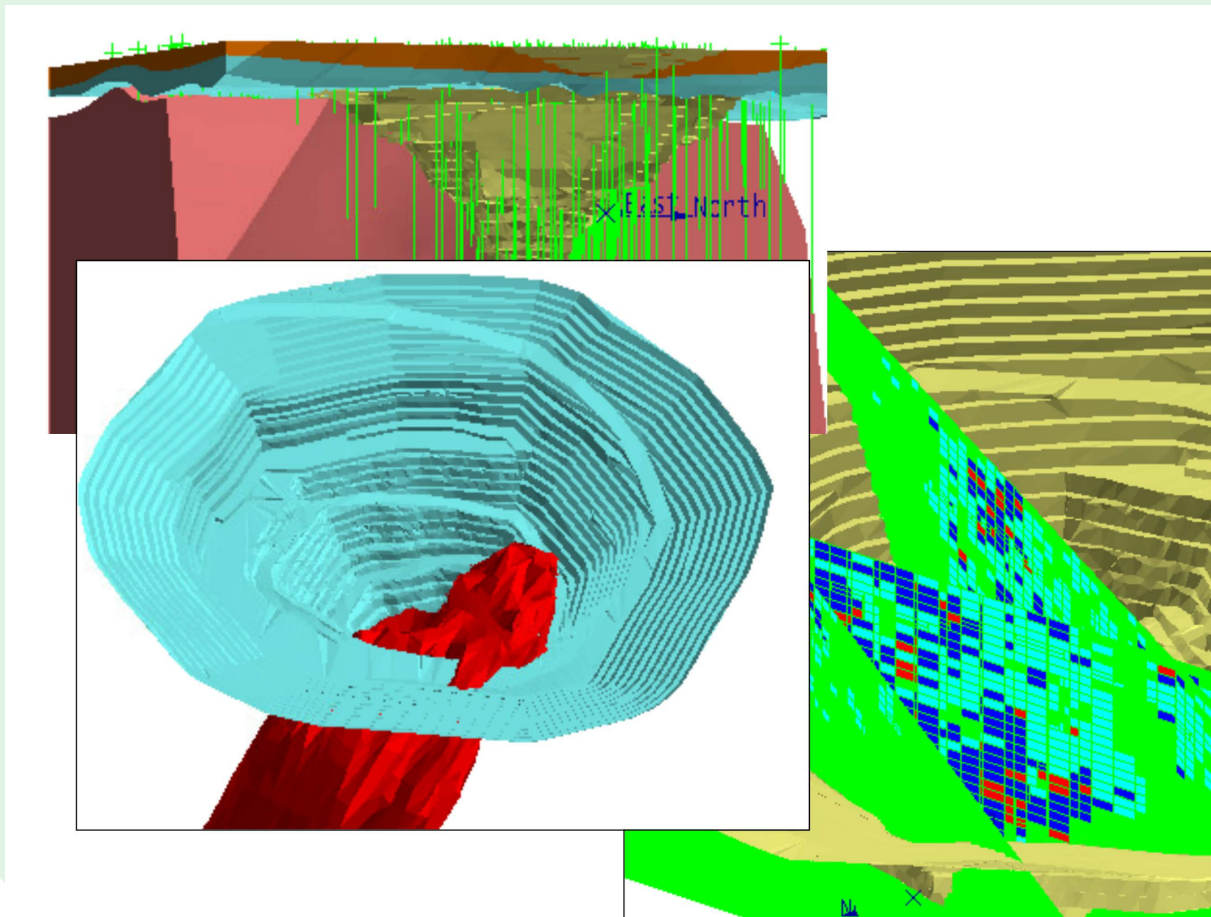


# MINE3220

Resource Estimation

Term 1, 2023



## Course Overview

### Staff Contact Details

#### Convenors

Name	Email	Availability	Location	Phone
Hamed Lamei Ramandi	<a href="mailto:h.lameiramandi@unsw.edu.au">h.lameiramandi@unsw.edu.au</a>		Room 156, OMB, UNSW Kensington Campus	+61 (2) 9065 7310
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### School Contact Information

School of Minerals and Energy Resources  
Old Main Building, Level 1, 159 (K15)  
UNSW SYDNEY NSW 2052 AUSTRALIA

For current students, all enquiries and assistance relating to enrolment, class registration, progression checks and other administrative matters, please see [The Nucleus: Student Hub](#).

#### Web & Important Links:

[School of Minerals and Energy Resources](#)

[The Nucleus Student Hub](#)

[Moodle](#)

[UNSW Handbook](#)

[UNSW Timetable](#)

[Student Wellbeing](#)

[Urgent Mental Health & Support](#)

[Equitable Learning Services](#)

[Faculty Transitional Arrangements for COVID-19](#)

## Course Details

### Units of Credit 6

### Summary of the Course

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. Layer 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 and Block modelling
- JORC Code
- Mine planning process
- Roles of feasibility studies
- Fundamental financial concepts for mining operations
- Mining business framework

### 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 the mine planning process.

### Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Understand the mine planning process and the impact of the economic environment on mining	PE1.3, PE1.5, PE1.6
2. Appreciate the role of feasibility studies in mine planning	PE1.3, PE1.5, PE1.6
3. Create coal and metalliferous resource models from exploration datasets using appropriate software tools and various estimation techniques	PE1.2, PE1.3, PE2.1, PE2.2, PE2.3, PE3.4, PE1.1, PE1.6, PE3.2, PE3.6
4. Evaluate the merits and drawbacks of various estimation methods relevant to specific mineral deposit types	PE1.2, PE1.3, PE1.5, PE2.1, PE3.4
5. Report resources and reserves using the JORC code	PE1.3, PE1.5, PE1.6, PE3.1, PE3.2, PE3.5, PE3.6, PE2.4
6. Demonstrate an appreciation of the time value of money, discount rates, commodity markets, the required rate of return to	PE1.2, PE1.3, PE1.5, PE2.1, PE3.2, PE3.5

Learning Outcome	EA Stage 1 Competencies
equity	
7. Explain the unique characteristics of mining and their implications for mine economics	PE1.3, PE1.5, PE1.6, PE3.1, PE2.4

## Teaching Strategies

This course uses a number of different teaching and learning approaches including:

- Lectures
- Tutorials
- Software applications
- Self-directed activities


1. Lectures: Learning will be supported by lectures designed to provide a framework for knowledge construction. Relevant learning activities support each new topic introduced. Lectures are not the primary means of delivering content, as a wide range of resources will be provided to students to use throughout the course.
2. Tutorials: Project work will be supported with tutorials as needed. The contents of these are aligned with the projects to help students.
3. Project-based learning: This course utilises project-based learning methods. Students will be given one group project and one individual project to work on. For the group project, students are required to share the project workload and have weekly meetings and discussions.

## Additional Course Information

This course assumes that a student:

1. is currently enrolled in the Mining Engineering single degree program or a Mining Engineering double degree program at UNSW; and
2. 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
3. a basic knowledge of mining, geology and statistics.
4. a basic knowledge of EXCEL with ability to carry out regressions & sumproduct functions

## Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Project 1	25%	Provided in the Project	1, 2, 3, 4, 5, 6, 7
2. Project 2 	25%	Provided in the Project	1, 2, 3, 4, 5, 6, 7
3. Topic Quizzes	10%	Refer to Moodle	1, 2, 3, 4, 5, 6, 7
4. Final Exam	40%	Exam Period	1, 2, 3, 4, 5, 6, 7

### Assessment 1: Project 1

**Start date:** Provided in the Project

**Due date:** Provided in the Project

The first project is individual and includes using a software tool (MS Excel) on a real case study to understand the structure of exploration data files, create, validate and composite a borehole database, create contour plots of coal quality by using a simple surface modelling package, carry out resource estimation and reporting of a coal deposit according to the JORC Code, and become familiar with the process of converting coal resources to reserve status and the associated cost.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

### Assessment 2: Project 2 (Group)

**Start date:** Provided in the Project

**Due date:** Provided in the Project

The second project is a group project and includes the process of orebody resource estimation using a software tool (Maptek Vulcan) on a real case study to understand the structure of exploration data files, create, validate and composite a drillhole database, build a block model, estimate grades to blocks using Inverse Distance Technique, generate the reserves, and become familiar with an orebody modelling and resource estimation software package. Groups must present their result as a technical report and presentation.

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

### Assessment 3: Topic Quizzes

**Start date:** Refer to Moodle

**Due date:** Refer to Moodle

Short answer and multiple choice quizzes that covers topics delivered in the lectures and tutorials.

### Assessment 4: Final Exam

**Start date:** Exam Period

**Due date:** Exam Period

Final exam.

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

## Course Schedule

Class time schedule:

Tue 10:00 - 12:00 (Weeks:1-5,7-10)

Thu 14:00 - 16:00 (Weeks:1-5,7-10)

The lectures will be provided online on moodle. There will be unstructured QA-orientated sessions covering lecture materials. If there are no students in attendance by the first 20 mins, the session will be abandoned for that day.

The tutorial will be face-to-face on campus.

The detail of the sessions will be announced on Moodle.

[View class timetable](#)

## Timetable

Date	Type	Content
Week 1: 13 February - 17 February	Lecture	Introduction to the Course  Introduction, Data Collection and Sampling Theory  Data Compositing
Week 2: 20 February - 24 February	Lecture	Global resource estimation  Domain Model concepts
	Tutorial	Discussion on Assignment 1  Discussion on MyAccess, Vulcan
Week 3: 27 February - 3 March	Lecture	Mine Planning Process.  Role of Feasibility Studies  Coal Mine Planning
	Tutorial	Discussion of Assignment 2
Week 4: 6 March - 10	Lecture	Coal Lectures (Optional)

March		JORC 2012 lectures
	Tutorial	Discussion on Assignments and Software Tutorial
Week 5: 13 March - 17 March	Lecture	Geostatistics 1 Geostatistics 2
	Tutorial	Discussion on Assignments and Software Tutorial
Week 7: 27 March - 31 March	Lecture	Financial Concepts
	Tutorial	Discussion on Assignments and Software Tutorial
Week 8: 3 April - 7 April	Lecture	Cost Estimation
	Tutorial	Discussion on Assignments and Software Tutorial
Week 9: 10 April - 14 April	Lecture	Mineral Economics
	Tutorial	Project 2 progress review
Week 10: 17 April - 21 April	Lecture	Course review

## Resources

### Prescribed Resources

#### **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 notes may be viewed and downloaded from Moodle.

#### **Text**

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

#### **Other Resources**

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:

1. 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)
2. Microsoft Excel
3. Vulcan Manual on Moodle

### Course Evaluation and Development

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.

### Laboratory Workshop Information

The software tutorials will be conducted at OMB computer labs (G48). However, there is a possibility of online tutorials if restrictions limit access to the labs. You will be notified in case of any change.

## Submission of Assessment Tasks

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.

## Course completion

Course completion requires submission of all assessment items. Failure to submit all assessment items may result in the award of an Unsatisfactory Failure (UF) grade for the Course unless special consideration has been submitted and approved.

## Late Submission of an Assignment

Full marks for an assessment are only possible when an assessment is received by the due date. Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item. The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark, or
- Online quizzes where answers are released to students on completion, or Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or Pass/Fail assessment tasks.

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 section below.

## Special Consideration

You may be eligible for special consideration, when an illness or other short-term events beyond your control (exceptional circumstances) affect your assessment performance. More details on special consideration can be found at: [www.student.unsw.edu.au/special-consideration](http://www.student.unsw.edu.au/special-consideration)

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.

## Student Support

The University and the Faculty provide a wide range of support services for students, including:

- Library training and support services - [www.library.unsw.edu.au](http://www.library.unsw.edu.au)
- Academic Skills Support - <https://www.student.unsw.edu.au/skills>
- Psychology and Wellness - [www.counselling.unsw.edu.au](http://www.counselling.unsw.edu.au)

**Equitable Learning Services** aims to provide all students with a free and confidential service that provides practical support to ensure that your health condition doesn't adversely affect your studies. <https://student.unsw.edu.au/els>

## 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](http://www.student.unsw.edu.au/plagiarism).

All MERE 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 academic skills, please contact the Academic Skills Support or view some of the resources on their website: <https://www.student.unsw.edu.au/skills>. The Academic Skills Team can provide resources, support and assistance to help you improve your academic 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.

## Academic Information

### Course Results

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

- LE – indicates you have not completed one or more items of assessment; or
- WD – indicates 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.

## Studying a course in the School of Minerals and Energy Resources Engineering at UNSW

### Student Resources

This engineering [student resources](#) section collates useful advice and information to ensure you're able to focus on your studies.

### Computing Resources and Internet Access Requirements

UNSW Minerals and Energy Resources Engineering provides blended learning using the on-line Moodle LMS (Learning Management System). Also see - Transitioning to Online Learning: [www.covid19studyonline.unsw.edu.au](http://www.covid19studyonline.unsw.edu.au)

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
- Petroleum Engineering Students: TETB LG34 & LG 35

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](http://www.student.unsw.edu.au/moodle-system-requirements)

## 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](http://www.moodle.telt.unsw.edu.au)

*This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.*

## 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 instructions on how to redirect your UNSW emails: ["How can I forward my emails to another account?"](#)

## 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 should be directed to the Course Convenor

## Image Credit

We created this.

## CRICOS

CRICOS Provider Code: 00098G

## **Acknowledgement of Country**

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

## Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	✓
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	✓
PE3.5 Orderly management of self, and professional conduct	✓
PE3.6 Effective team membership and team leadership	✓