Faculty of Engineering

School of Minerals and Energy Resources Engineering

Postgraduate Course Outline

MINE8790
Advanced Mineral Economics and Project Evaluation

Dr Carlos Tapia
1. INFORMATION ABOUT THE COURSE

Course Code: MINE8790  Semester: T1, 2020  Level: PG  Units/Credits: 6 UOC
Course Name: Advanced Mineral Economics and Project Evaluation

Course Convenor: Dr Carlos Tapia
Contact Details
School of Mining Engineering
Old Main Building, Rm 159J
EMAIL: @unsw.edu.au
Phone:
Contact times are scheduled for:
• 20th to 24th of April as a short course

1.1. Course Description

The course essentially includes two distinct components:
• Mineral Economics - Review of the mineral economics theory and its relevance for economic, social and technological development supported by the study of the fundamentals of the economic theory, both Macro- and Micro-Economics including - but not limited to - monetary policy, supply and demand, elasticity, market agents, markets structures and competitive strategies, business cycles and their relevance for mineral commodity markets.
A detailed review of the main characteristics of the mineral extraction industry encompassing their markets and production features, and their relevance for global and local economies. An analysis of mineral commodity markets (energy, metallic and non-metallic) encompassing the study of the evolution of the economic environment and geopolitical scenario, markets behaviour and key drivers, technology and production costs, uncertainties, costumer’s behaviour, pricing schemes and market power, entry barriers, trading features and the role of governments. A relevant in-class case study is used to assess the effects of the economic environment, market structure and economic agents (government, companies and society) on the performance, risk level and feasibility of mineral extraction and processing projects and operations.
• Project evaluation and risk analysis –Review of project evaluation techniques for mineral projects including an overview of financial maths, cash flow structure, EBITDA, NPV, relevant regulations, uncertainties, risks management and sensitivity analysis. Review of Valuation techniques applied to the mineral extraction sector - technical and market based – and review of relevant stock exchange valuation regulations and guidelines (i.e. VALMIN)

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.

1.3. Assumed Knowledge

This course assumes a student has knowledge of:
• basic mining and geological terms and descriptions;
• basic knowledge on the economic theory and financial maths
• as this is a technical course in a postgraduate program, a fundamental understanding of mathematics and physics is required.
2. AIMS, LEARNING OUTCOMES AND GRADUATE ATTRIBUTES

2.1. Course Aims

The course aims to provide mining engineers, and other industry professionals, with leading practice knowledge on mineral economics and project evaluation.

2.2. Learning Outcomes

At the conclusion of this course the student will be able to:

1. Demonstrate a practical competence and understanding in mineral economic, and project valuation and evaluation.
2. Demonstrate knowledge of mineral commodity markets and price behaviour and strategic decision making.
3. Demonstrated knowledge on mineral commodity price forecasting techniques
4. Practical application of knowledge to understand and assess mineral commodity price forecasting and use it for mining projects evaluation.
5. Identify and assess financial information for investment decision making purposes
6. Demonstrate knowledge on the financial techniques and indexes used in the industry to valuate and evaluate mining projects, and assess risks & uncertainties

2.3. Graduate Attributes

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

1. The skills involved in scholarly enquiry
2. An in-depth engagement with the relevant disciplinary knowledge in its interdisciplinary context
3. The ability to engage in independent and reflective learning
4. The skills required for collaborative and multidisciplinary work
5. The skills of effective communication

3. REFERENCE RESOURCES

3.1. Reference Materials

- Darling, P., 2011. SME mining engineering handbook. SME
3.2. Other Resources


Further reading recommendations, including conference papers, will be provided on commencement of the course

3.3. Online Resources

Selected readings as well as other supporting material (e.g. course outline and lecture notes will be made available on LMS.

UNSW Mining and Petroleum subject guide (including a link to ACARP and how to find the reports in the catalogue) [http://subjectguides.library.unsw.edu.au/content.php?pid=7632&sid=52212](http://subjectguides.library.unsw.edu.au/content.php?pid=7632&sid=52212)


New postgraduate course students are strongly advised to visit the above website and complete the ELISE and ELISE Plus tutorials. These will help develop skills in finding, using and evaluating scholarly information.

4. COURSE CONTENT AND LEARNING ACTIVITIES

4.1. Learning Activities Summary

The learning activities for MINE8790 are summarised in the following table

*Table 1 – Daily schedule of topics and activities*

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Time</th>
<th>Topic or Activity</th>
<th>Presenter</th>
</tr>
</thead>
</table>
| 1   | Monday 20th Apr | 8:30 – 10:30 am | Fundamentals of Economics – Macroeconomics  
• The Circular Flow of the Economy  
• Consumption, Savings, and Investment  
• National Accounting | Dr Tapia |
|     |              | 10:30 – 11:00 | Morning Tea                                                                       |           |
|     |              | 11:00 – 12:00 pm | Fundamentals of Economics – Macroeconomics  
• Economic Grow (GDP and Investment)  
• Monetary Policy, Exchange Rate and Inflation |           |
|     |              | 12:30 – 1:30 | Lunch                                                                             |           |
|     |              | 1:30 – 3:00 | Fundamentals of Economics – Microeconomics  
• The Basics of Supply and Demand  
• Elasticity |           |
|     |              | 3:00 – 3:30 | Afternoon Tea                                                                     |           |
|     |              | 3:30- 5:30 | Fundamentals of Economics  
• Production  
• The Cost of Production |           |
<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Time</th>
<th>Topic or Activity</th>
<th>Presenter</th>
</tr>
</thead>
</table>
| 2    | Tuesday 21<sup>st</sup> Apr | 8:30 – 9:30 am  | Quiz (A01)  
Microeconomics in mining projects                     | Dr Tapia      |
|      |             | 9:30 – 10:30 am | Introduction to Mineral Economics  
• History and Definition                                |               |
|      |             | 10:30 – 11:00   | Morning Tea                                            |               |
|      |             | 11:00 – 12:00 pm| Introduction to Mineral Economics  
• Factors Affecting Markets  
• Market Balance                                         |               |
|      |             | 12:30 – 1:30    | Lunch                                                   |               |
|      |             | 1:30 – 3:00     | Mineral Commodity Markets  
• Configurations, Agents and Drivers                      |               |
|      |             | 3:00 – 3:30     | Afternoon Tea                                          |               |
|      |             | 3:30- 5:30      | Markets Behaviour  
• Energy Commodities  
• Metallic Commodities – Iron Ore                        |               |
| 3    | Wednesday 22<sup>nd</sup> Apr | 8:30 – 10:30 am  | Markets Behaviour  
• Metallic Commodities – Light, Precious and Base Metals | Dr Tapia      |
|      |             | 10:30 – 11:00   | Morning Tea                                            |               |
|      |             | 11:00 – 12:00 pm| Price Forecasting  
• Techniques                                              |               |
|      |             | 12:30 – 1:30    | Lunch                                                   |               |
|      |             | 1:30 – 3:00     | Price Forecasting  
• Modelling  
Individual Exercise (A02)                                 |               |
|      |             | 3:00 – 3:30     | Afternoon Tea                                          |               |
|      |             | 3:30- 5pm latest| Group Exercise (A03)  
• Investment strategy                                      |               |
| 4    | Thursday 23<sup>rd</sup> Apr | 8:30 – 10:30 am  | Strategic Management  
• Project Evaluation vs Valuation                         | Steve Gemell  |
|      |             | 10:30 – 11am    | Morning Tea                                            |               |
|      |             | 11:00 – 12:00 pm| Strategic Management  
• Project Evaluation vs Valuation                         |               |
|      |             | 12:30 – 1:30    | Lunch                                                   |               |
|      |             | 1:30 – 3:00     | Estimating Revenue  
• The Mine as Economic Unit                               |               |
|      |             | 3:00 – 3:30     | Afternoon Tea                                          |               |
|      |             | 3:30- 5:30      | Estimating Revenue  
The Mine as Economic Unit                                  |               |
| 5    | Friday 24<sup>th</sup> Apr | 8:30 – 10:30 am  | Risks & Uncertainties  
• Known Unknowns and Unknown Unknowns                     | Dr Tapia      |
|      |             | 10:30 – 11:00   | Morning Tea                                            |               |
|      |             | 11:00 – 12:00 pm| Risks & Uncertainties  
• Assessment & Management                                  |               |
|      |             | 12:30 – 1:30    | Lunch                                                   |               |
|      |             | 1:30 – 3:00     | Group exercise – Case Study  
(unassessed)                                                  |               |
|      |             | 3:00 – 3:30     | Afternoon Tea                                          |               |
|      |             | 3:30- 5:30      | Test                                                    |               |
5. COURSE ASSESSMENT

Completion of this course usually requires around 150 hours of work. Course delivery accounts for around 40 hours, hence 110 hours of additional online and assessment work is required. The formal lectures and laboratory classes are delivered in a Short Course at UNSW. (see course overview for schedule). **Attendance at all Short Course sessions is compulsory.** Prior to the short course you should log into Moodle where teaching and related material is available. There will be no hard copy notes provided.

5.1. Assessment Summary

All assessments are due 12 noon Sydney time on Monday of the week, unless otherwise indicated in the table below.

<table>
<thead>
<tr>
<th>Assessment task</th>
<th>Due date</th>
<th>Weight</th>
<th>Assessment</th>
<th>Learning outcomes assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A01</td>
<td>21st Apr</td>
<td>15%</td>
<td>Quiz: Determine Microeconomic components in the mining business</td>
<td>1, 2, 5</td>
</tr>
<tr>
<td>A02</td>
<td>22nd Apr</td>
<td>15%</td>
<td>Individual Exercise: Prices Forecasting – Technique Selection, Modelling and Application</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>A03</td>
<td>22nd Apr</td>
<td>20%</td>
<td>Group Exercise: Investment strategy. To be presented in-class</td>
<td>2, 5, 6</td>
</tr>
<tr>
<td>A04</td>
<td>15th May</td>
<td>25%</td>
<td>Groups: Mining Project Valuation. Submit UNSW Moodle Dropbox</td>
<td>1, 4, 5, 6</td>
</tr>
<tr>
<td>A4.0</td>
<td>29th May</td>
<td>25%</td>
<td>Individual Report: Mining Project Investment. Financial Evaluation, Financing strategy and Risk Assessment. Submit UNSW Moodle Dropbox</td>
<td>1, 2, 3, 4, 5, 6</td>
</tr>
</tbody>
</table>

All the course materials and assignments will be available online through Moodle. Access to the Moodle site is via the Moodle icon on the MyUNSW homepage, or at [https://moodle.telt.unsw.edu.au](https://moodle.telt.unsw.edu.au)

5.2. Assessment Requirements

*Compliance with School Policy on assignment submissions*

- Prior to submission of an assignment, students are advised to read the School Policy on Assignment Submissions which can be viewed at: [http://www.engineering.unsw.edu.au/mining-engineering/assignment-submission-policy](http://www.engineering.unsw.edu.au/mining-engineering/assignment-submission-policy)

- In particular, students should make sure they have read and understood the:
  - Declaration of Academic Integrity;
  - Assignment Submission requirements detailed in the University Policies section of the Course Outline; and
  - School Policy on Assignment Submission available on the School’s website (the web address is given in the Course Outline). In particular note the requirement that only PDF documents should be uploaded and the required file naming convention.
• A submission that is non-compliant with the Policy may not be marked or penalties applied. Examples of a non-compliant assignment include the assignment submission:
  o is not a PDF document or a zip file [not marked];
  o does not contain a completed copy of the Student Declaration Statement [not marked];
  o does not use the required file naming convention – Item #6 in the Policy on electronic submission. A file name such as <ManagementAssignment.pdf> is NOT compliant. [minimum 10% penalty]

5.3. Form of assignment for submission

• The submission must be presented in the form of a formal technical report.
• The report must be prepared in accordance with the report writing standards of the School as contained in the Report Writing Guide for Mining Engineers. A copy can be obtained from the School webpage at http://www.mea.edu.au/asset/52df6e0042c1b/mea-report-writing-guide-e-book.pdf
• It is strongly recommended when preparing the major assignment, that a student use the official School Report Style Template, a copy of which is available for download from LTMS. The template has embedded in it a copy of the Student Declaration Form and hence the student need not attach a copy of coversheet to their assignment. If the template is not used then the student must incorporate the Student Declaration Form in their report.

5.4. Method of submission

• All assessments for this course are to be submitted in electronic format through the Learning & Management System (LMS) for this course at https://moodle.telt.unsw.edu.au/login/index.php
• The student must use the following file naming convention for the assignment: <StudentFamilyNameInitial_CourseCode_AssignmentNumber>.

  A typical filename would be <SmithP_MINE8790_A1> which corresponds to:
  o Student Family Name: Smith
  o Student First Initial: P
  o Course Code: MINE8790

Assignment number: A1...as defined in the table in the section on Assessment Summary
6. ASSESSMENT CRITERIA

The student should be cognisant that a range of factors is often being assessed in any one assignment; not just whether the final results are numerically correct. Consideration is given to other relevant elements that contribute to the Learning Outcomes of the course as well as the Graduate Attributes of the overall degree program.

<table>
<thead>
<tr>
<th>Assignments and examination</th>
<th>% MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerical</strong></td>
<td></td>
</tr>
<tr>
<td>Answer is correct and substantiated by complete mathematical working</td>
<td>100%</td>
</tr>
<tr>
<td>Deduct for incorrect or unspecified units</td>
<td>20%</td>
</tr>
<tr>
<td>Deduct for excessive round off error</td>
<td>10%</td>
</tr>
<tr>
<td>Answer is correct but not substantiated by complete, correct working.</td>
<td>up to 30% depending upon how much of the correct working is given</td>
</tr>
<tr>
<td>Answer is incorrect but principles of mathematical working are correct</td>
<td>60%</td>
</tr>
<tr>
<td>Add if the answer is of reasonable Magnitude</td>
<td>20%</td>
</tr>
<tr>
<td>Add if incorrect only because of an error of transcription of numerical data</td>
<td>10%</td>
</tr>
<tr>
<td>Mathematical working is incomplete or incorrect</td>
<td>up to 50% depending upon how much of the correct working is given</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graphical answers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy with which the data are presented</td>
<td>60%</td>
</tr>
<tr>
<td>Layout</td>
<td>20%</td>
</tr>
<tr>
<td>Tidiness</td>
<td>20%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Descriptive answers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness and accuracy of answer</td>
<td>70%</td>
</tr>
<tr>
<td>Clarity of expression</td>
<td>30%</td>
</tr>
<tr>
<td>Deduct for irrelevant material</td>
<td>up to 40%</td>
</tr>
</tbody>
</table>
7. STUDYING A PG COURSE IN MINING ENGINEERING AT UNSW

7.1. How We Contact You

At times, the School or your lecturers may need to contact you about your course or your enrolment. Your lecturers will use the email function through 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: www.it.unsw.edu.au/students/zmail/redirect_external.html

7.2. 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: mere.teaching@unsw.edu.au
Course inquiries: these should be directed to the course convenor.

7.3. Computing Resources and Internet Access Requirements

UNSW Mining 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.

You can access the School’s computer laboratory in-line with the School laboratory access guidelines and Class bookings.

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)
- Chrome browser or FireFox
- ability to view streaming video (high or low definition UNSW The Box options)

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

7.4. Accessing Course Materials through Moodle

Course outlines and support materials are uploaded on a Learning Management System (LMS) - Moodle. All enrolled students are automatically included on the Moodle for each course. To access these documents, please visit: www.moodle.telt.unsw.edu.au

7.5. Assessment Criteria for Postgraduate Programs

The assessment criteria provide a framework for you to assess your own work before formally submitting major assignments to your facilitator. Your facilitator 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. All students are encouraged to take a closer look at this framework before, during and after completing an assignment.

The descriptions in the framework will help you and your facilitator to identify where your assignment is ranked – from excellent to poor achievement. We ask that you don’t use the guidelines as a checklist, but as a tool to assess the quality of your work. Your facilitator will also be looking at the quality, creativity and the presentation of your written assignment as they review the framework.

7.6. Assignment Submissions

The School has developed a guideline to help you when submitting a course assignment. Please take a closer look at all these details on our website: www.engineering.unsw.edu.au/mining-engineering/assignment-submission-policy

We encourage you to retain a copy of every assignment submitted for assessment for your own record either in hardcopy or electronic form. On a rare occasion, assignments may be mislaid, and we may contact you to re-submit your assignment.

All your assignments will need to have a completed PG coversheet. Refer to last page of outline.

7.7. Late Submission of an Assignment

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. Details on deductions that are automatically applied to late submissions are available on our webpage: http://www.engineering.unsw.edu.au/mining-engineering/late-submissions

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 as soon as possible: https://student.unsw.edu.au/special-consideration

7.8. Course Results

For details on UNSW assessment policy, please visit: https://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-enrol in the course.
7.9. 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: https://www.student.unsw.edu.au/special-consideration

7.10. 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: http://www.studentequity.unsw.edu.au/

7.11. 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 https://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: http://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.

7.12. Report Writing Guide for Mining Engineers

7.13. 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.

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 Title: ____________________________
Course Code: ______________  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.