



# **GSOE9830**

## **Economic Decision Analysis in Engineering**

Term Three // 2020

## Course Overview

### Staff Contact Details

#### Convenors

| Name             | Email                | Availability                              | Location | Phone |
|------------------|----------------------|---|----------|-------|
| Dr. Shiva Abdoli | s.abdoli@unsw.edu.au | 9:00 - 12:00 midday<br>and by appointment |          |       |

#### Lecturers

| Name         | Email                  | Availability  | Location | Phone             |
|--------------|------------------------|---|----------|-------------------|
| Guy Allinson | g.allinson@unsw.edu.au | 9:00 - 12:00 midday<br>and by appointment<br>(week 1-5) |          | (02) 9385<br>5189 |

### School Contact Information

#### Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

#### Hours

9:00–5:00pm, Monday–Friday\*

\*Closed on public holidays, School scheduled events and University Shutdown

#### Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

#### Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office\*\*

\*\*Please note that the School Office will not know when/if your course convenor is on campus or available

## **Email**

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries

## Course Details

### Credit Points 6

### Summary of the Course

Project initiation and development, review of practical decision-making problems and relevant techniques, benefit/cost analysis, time value of money, Nominal and effective interest rate, calculation involving multiple interest formulae, internal rate of return, payback period method, comparisons of alternative investments, depreciation methods, income tax consideration, inflation, replacement analysis, sensitivity analysis, life-cycle costing, economic analysis of projects.

### Course Aims

The course consists of two sections:

- Section 1 (Weeks 1-5) Net Cash Flow and Economic Indicators •
- Section 2 (Weeks 6-10): Risk Analysis

The course will focus on providing comprehensive coverage of the concepts of economic decision analysis in engineering and will also address practical concerns of engineering economic analysis. The objective of the course is to provide engineers and managers with the knowledge of principles, basic concepts and methodology of economic decision analysis. This will assist students in developing proficiency with the methods and with the processes for making rational decisions they are likely to encounter in professional practice.

### Course Learning Outcomes

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

| Learning Outcome  | EA Stage 1 Competencies           |
|---|-----------------------------------|
| 1. Apply the knowledge of systematic evaluation of the costs and benefits of proposed technical and business project and ventures   | PE1.2, PE1.3, PE2.4               |
| 2. Understand cost concepts, cash flows, their estimation and interest formulae. Also, to understand various depreciation methods and learn about the effect of income tax on economy studies | PE1.2, PE1.3, PE3.4               |
| 3. Be familiar with various methods for economy studies and comparing alternative investments   | PE2.3, PE2.4, PE3.4               |
| 4. Understand the role of probability analysis in decision making and decision tree analysis  | PE1.1, PE1.2, PE1.3, PE2.4, PE3.4 |
| 5. Value information and analyse a portfolio of investments   | PE2.1, PE2.2, PE2.3, PE3.1, PE3.6 |
| 6. Carry out Monte Carlo simulations  | PE2.1, PE2.2, PE2.3, PE2.4        |

## **Teaching Strategies**

Readings and lectures will be used to introduce and explain the theoretical foundations of various economic analysis principles. Problem solving exercises will be used to apply and reinforce the understanding of the concepts and how they can be applied to solve problems encountered in the real world. Students are expected to complete the assigned readings prior to lectures so that they can contribute to class discussions.

## Assessment

### Assessment Tasks

| Assessment task                         | Weight | Due Date       | Student Learning Outcomes Assessed |
|---|--------|----------------|------------------------------------|
| Module1-Class Test                      | 20%    | Not Applicable | 1, 2, 3                            |
| Module 1-Class Test                     | 30%    | Not Applicable | 1, 2, 3                            |
| Module 2- Final end-of-term examination | 50%    | Not Applicable | 4, 5, 6                            |

### Assessment Details

#### Assessment 1: Module1-Class Test

**Start date:** 02/10/2020 09:00 AM

**Length:** 1 hour

**Details:**

The exam includes lecture material from week 1 and 2 and will happen during the week 3 class.

#### Assessment 2: Module 1-Class Test

**Start date:** 16/10/2020 09:00 AM

**Length:** 2 hours

**Details:**

The exam will happen during the week 5 class.

#### Assessment 3: Module 2- Final end-of-term examination

**Start date:** Not Applicable

**Length:** 2 hour

**Details:**

The final examination for the course is a written end-of-term examination of two hours duration and will include material covered in Module 2.

**Additional details:**

The final exam will happen during the exam period, the date TBC

## Attendance Requirements

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

## Course Schedule

[View class timetable](#)

### Timetable

| Date                                | Type    | Content   |
|-------------------------------------|---------|---|
| Week 1: 14 September - 18 September | Lecture | Introduction, Net cash flow analysis, Net cash flow and profit, Taxation.         |
| Week 2: 21 September - 25 September | Lecture | Tax and loss carry forward, Sunk Costs, Inflation, Real and Nominal cash flow     |
| Week 3: 28 September - 2 October    | Lecture | Net present value (NPV), Features of NPV, Real and Nominal NPVs                   |
| Week 4: 5 October - 9 October       | Lecture | Internal Rate of Return (IRR), Multiple IRRs, Comparing Investments               |
| Week 5: 12 October - 16 October     | Lecture | Incremental net cash flow, Tax relief. Mid-term Exam                              |
| Week 6: 19 October - 23 October     | Lecture | Uncertainty in decision analysis, Sensitivity analysis, Probability distributions |
| Week 7: 26 October - 30 October     | Lecture | Using skewed probability distributions, Monte Carlo simulation                    |
| Week 8: 2 November - 6 November     | Lecture | Uncertain decisions and risk sharing  |
| Week 9: 9 November - 13 November    | Lecture | Many investments  |
| Week 10: 16 November - 20 November  | Lecture | Decision trees, Value of information  |



## Resources

### Prescribed Resources

Lecture outlines, course notes and exercises will be provided on Moodle.

*Moodle:* <https://moodle.telt.unsw.edu.au/login/index.php>

### Recommended Resources

Text Book 1

W.G. Sullivan, E.M. Wicks, C.P. Koelling, "Engineering Economy", Prentice Hall International, 17th Ed., 2018.

This textbook is available for purchase at the UNSW book shop.

Text Book 2 (optional)

"Decision Analysis for Petroleum Exploration", Paul Newendorp and John Schuyler, Planning Press 2000

*UNSW Library website can be accessed at* <https://www.library.unsw.edu.au/>

## Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course recent improvements resulting from previous years' feedback include more real-life examples and case studies, as well as problems solved in demonstration and provided on Moodle. All of these suggestions are incorporated into the course syllabus.

# Submission of Assessment Tasks

## Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

## Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

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.

Work submitted after the 'deadline for absolute fail' is not 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 are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

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

## Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

## Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

**Please note** that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required in T3.

## Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off 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. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: [student.unsw.edu.au/plagiarism](http://student.unsw.edu.au/plagiarism). The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also 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 tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## Academic Information

### Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

### On-campus class attendance

Public distancing conditions must be followed for all T3 face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. Class rosters will be attached to corresponding rooms and circulated among lab demonstrators. No over-enrolment is allowed in face-to-face class. Students enrolled in online classes can swap their enrolment from online to other additional, **but limited**, number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where 1.5 metres physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

## Other Matters

### Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)

- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

## Important Links

- [Moodle](#)
- [Lab Access](#)
- [Health and Safety](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Engineering Student Support Services Centre](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)
- [UNSW Mechanical and Manufacturing Engineering](#)
- [Equitable Learning Services](#)

## Image Credit

Synergies in Sound 2016

## 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   | ✓ |