Course Outline
GSOE9010
Engineering Research Skills
Term 1 2022

Contents

Course Details

Course Code:	GSOE9010
Course Title:	Engineering Research Skills
Units of Credit:	6
Course Web Site:	https://moodle.telt.unsw.edu.au/course/view.php?id=65200#section-0
Handbook Entry:	https://www.handbook.unsw.edu.au/postgraduate/courses/2022/gsoe9010/

Classes

Each student is either in a **Tuesday** stream or a **Wednesday** stream. All students from both streams will attend a lecture on **Monday from 5 to 6pm** online. Each student will attend a “workshop” from **4 to 6 PM on Tuesday or Wednesday**, which includes one hour of facilitated group work and one

hour of tutorial. Tutorials will be conducted online, the access links are posted on the GSOE9010 Moodle page.

Course Staff

Staff Name	Role	Email
Ned Ekins-Daukes	Course coordinator	nekins@unsw.edu.au
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Course Summary

This course explores the various skills and processes in carrying out an engineering research project: formulating a research problem, exploring prior work, designing experiments to test hypotheses, evaluating the results, and presenting the work both verbally and in a written report.

Course Aims

This course aims to prepare students to carry out their research project in later semesters of their MEngSc program or for undertaking research projects in an industrial setting. This course covers skills common to both contexts.

Student Learning Outcomes

After completing this course, students will be able to:

1. formulate a research problem in engineering
2. conduct effective literature searches and filter relevant material
3. design a solution to the research problem
4. design experiments to demonstrate the effectiveness of the solution
5. collect and analyse experimental results
6. formulate valid conclusions from experimental results
7. present the results of the research effectively to an audience
8. write a well-structured and coherent research document
9. work effectively in a research team
10. develop a research profile
11. practice as an ethical researcher

The course requires students to produce the following:

- a poster and video for a team innovation project exploring a global engineering research challenge, case study and proposed solution
- an individual research proposal describing a problem and a research proposal for investigating it

In addition, students will be required to complete pre-lecture quizzes and actively participate in workshops conducted during the lecture period. Each student is required to facilitate one of the workshops.

This course contributes to the development of the following graduate capabilities:

Graduate Capability	Acquired in
scholarship: understanding of their discipline in its interdisciplinary context	Team project
scholarship: capable of independent and collaborative enquiry	Proposal, Team project
scholarship: rigorous in their analysis, critique, and reflection	Proposal
scholarship: able to apply their knowledge and skills to solving problems	Lectures, Proposal
scholarship: ethical practice	Lectures
scholarship: capable of effective communication	Lectures, Team project, Proposal
scholarship: information literate	Team project
scholarship: digitally literate	Team project, Proposal
leadership: enterprising, innovative and creative	Proposal
leadership: capable of initiating as well as embracing change	Lectures
leadership: collaborative team workers	Team project, Lectures
professionalism: capable of independent, self-directed practice	Team project, Proposal
professionalism: capable of operating within an agreed Code of Practice	Lectures

Assumed Knowledge

The only assumption we make is that students have completed an undergraduate degree in some branch of engineering.

Teaching Rationale

GSOE9010 employs student-centred learning as the basis for its instructional design and emphasises the importance of active learning. The teaching in this course is based on a flipped-classroom philosophy and includes project-based learning.

Teaching Strategies

The course provides a range of student-centred activities that draw on the prior knowledge of the students to exercise the particular research skills that the course develops. The lectures are designed to be a focal point for each week, providing a supportive forum for open discussion on the task in hand and supported through exercises in the tutorial classes, quizzes and assignments. Each element is designed to encourage independent and collaborative study and enquiry.

Teaching strategies used during the course include:

- small-group learning to understand the importance of teamwork in an engineering context and to demonstrate the use of appropriate collaboration to address research goals;
- explicit teaching including lectures and a range of teaching strategies to foster interest and support learning;
- structured occasions for reflection on learning, to allow students to reflect critically on topics discussed;
- extensive opportunities for whole group and small group dialogue and discussion, allowing students the opportunity to demonstrate their capacity to communicate.

These activities will occur in a climate that is supportive and inclusive of all learners.

Assessment

The following table summarises all of the assessment items in the course:

Assessment Item	Due Date	Weight
Pre-lecture Quizzes	Weeks 1-9	10%
Facilitation in Workshop	Allocated week	10%
Team Innovation Project	Weeks 7 & 10	25%
Individual Research Proposal	Week 10	55%

Standard UNSW grades (HD, DN, etc.) will be awarded. A combined overall mark of at least 50% is required in order to pass this course.

Full details on what is required for each submission will be posted on the course web site well before the due date. We give a brief summary of each assessment item below:

Workshop Facilitation

Students work in groups (usually 3 members) to prepare and facilitate a 50minute workshop during the first part of an allocated tutorial period. The workshop will follow a list of class activities; activities will be posted on the class Moodle site in the week prior to your facilitation.

(**Note:** Workshop facilitation is *mandatory*. Once workshop topics have been allocated, no changing of topic or week of presentation is allowed. A workshop cannot be delayed to another week. Any student who fails to present at the specified time will have to contact the lecturers for an alternative assessment. Please note medical or other supporting documentation will be required.)

Quizzes

Pre-lecture quizzes will be placed on the Moodle site to accompany the video material for each lecture. You should complete each quiz after you have viewed the corresponding videos. You will be allowed 1 attempt for the quiz. Each weekly quiz is worth 1.5 marks.

Team Innovation Project

Students will work in teams of 4 to 6 people to investigate a topic chosen in the first two tutorials. You should explore the engineering aspects of the topic, identifying research and innovation opportunities. The team should collaborate to assemble a set of resources on the topic, using whatever collaboration tools you wish. There are a number of milestones to be submitted during the semester (e.g. group roles, mind-map of the topic, bibliography, etc.). On Monday of Week 7, each team must submit a poster presenting the global status of research on that topic. Then, in Week 10, each team must submit a 3-minute video presenting a relevant specific case study and a proposal for an innovative engineering solution to the problem. The team will be awarded a mark for the poster and video, and each team member's mark will then be modified by the peer-assessment of their individual contribution.

Individual Research Proposal

Each student will choose a topic from their own discipline on which to develop a research proposal. This topic does not have to be related to the topic of their team project. The final proposal must contain describe the topic, current practice (and its deficiencies), and suggest an innovation to improve practice, along with a description of experimental work and its analysis that would be required to convince others that the innovation did improve practice. (Note that this is a *proposal* so you are not required to carry out any experiments). The proposal must be submitted on Friday of Week 10, and will be marked by the tutors and course lecturers.

If you have a valid (generally, a medical) reason for late submission, you must notify academic staff and submit a special consideration through the regular UNSW special consideration mechanisms.

Academic Integrity and Plagiarism

Plagiarism is defined as using the words or ideas of others and presenting them as your own. UNSW treats plagiarism by students as academic misconduct, which means that it carries penalties as severe as being excluded from further study at UNSW. There are several on-line sources to help you understand what plagiarism is and how it is dealt with at UNSW:

- Learning Centre: Plagiarism and Academic Integrity
- myUNSW: Plagiarism and Academic Misconduct

Make sure that you read and understand these. Ignorance is not accepted as an excuse for plagiarism.

Assessment tasks in this course, such as the research proposal and the team poster, will be checked for originality using TurnItIn. Blatant plagiarism, or unacceptably high “similarity scores” will be penalised. See assessment task sheets in Moodle for more details.

Late Penalties

If you have a valid (generally, a medical) reason for late submission, you must notify academic staff and submit a special consideration through the regular UNSW special consideration mechanisms.

Tasks that are submitted late without a valid reason will be penalised. Penalties vary between tasks are detailed in the assessment task sheets.

Participation Penalties

Attendance at all topic workshops and tutorial sessions is required for all students during weeks 1-10. Penalties of 0.5 marks per week of absence will apply. See Moodle document for more details ('Participation Policy' under the assessment task sheets section)

Resources for Students

There is no formal textbook for this course, you may wish to consult the following resources if you would like additional guidance:

Academic writing for graduate students : essential tasks and skills, John Swales, Christine B Feak, 3rd ed., Ann Arbor, Mich. : University of Michigan Press, 2012

The Literature Review : A Step-by-Step Guide for Students, Diana Ridley, Sage Publications Ltd (UK), 2012

Critical Reading and Writing for Postgraduates, Mike Wallace, Alison Wray, Sage Publications Ltd (UK), 2016

Writing for Science and Engineering: Papers, Presentations and Reports, Heather Silyn-Roberts, Oxford : Butterworth-Heinemann. 2000

Videos and other material will be made available as the course progresses.

The course Moodle site will hold all of the resources you need, apart from the ones you discover yourself during your exploration of topics for the team project and the research proposal.

Course Evaluation and Development

Your feedback is essential for its future development and we adjust the course in response to the comments we have received from student. With your feedback, we can continue adapting the course to best meet the needs of students in the future. Towards the end of the course you will be invited to provide feedback using a "My Experience" link on Moodle.