GMAT4060

Thesis A

Term 1, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Jinling Wang	jinling.wang@unsw.edu.au	You may contact me via Teams or email any time.	CE413	+61293854203

School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, 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

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)

Course Details

Units of Credit 6

Summary of the Course

This course is the first of two parts and is undertaken before GMAT4061 Thesis B, which should be taken in the following term. The Thesis involves formulating the designs for and solution to open-ended surveying and geospatial engineering problems, as well as challenging applications. The thesis project topics will be drawn from industry and emerging areas of research. The thesis projects will involve applications of material and skills learnt throughout the undergraduate program and will require creative thought. GMAT4060 Thesis A involves the formulation of a research project plan, research case study, project brief and documents and involves review of various literature.

Course Aims

This course enhances the student's skills for undertaking scholarly enquiry by attempting to achieve a specific topic objective within a defined period of time. A significant component of the course relates to the review of literature, which promotes independent and reflective learning as well as increases students' capacity to develop information literacy. The thesis is expected to reinforce the student's ability and confidence in both the oral and written communications of technical information.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Undertake and execute a research project	PE1.4, PE3.2, PE3.5
2. Conduct a thorough literature review	PE1.3, PE1.5
3. Satisfaction of intellectual curiosity and contribution of original ideas and independent research	PE1.2, PE3.3
4. Development of transferable skills in the process of developing and crafting a feasible project	PE1.6, PE3.1
5. Produce a self-contained technical report	PE1.1, PE1.4
6. Demonstrate an ability to work to produce designs which draw upon knowledge gained in the undergraduate program.	PE2.2, PE3.5
7. Be in a position to make a positive contribution to the workforce as a professional engineer.	PE1.5, PE2.3
8. Critically evaluate information and demonstrate deep engineering understanding of the given design project.	PE1.1, PE3.1, PE3.4

This course is designed to address the learning outcomes corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers.

Teaching Strategies

The thesis is an individual thesis in which each student works under the guidance of academic staff. Each student will have the flexibility in selecting a thesis topic which is related to contemporary practice or some emerging areas of research in the profession. The thesis research work involves investigations into various aspects of best professional practices or challenging technical development for engineering applications.

Major thesis project theme topics will be given to the class each year and the student will be guided to establish the project activities. The students are encouraged to propose her/his own thesis research topics. Some example project activities may include, such as, a) Positioning with smartphones, b) Building information modelling (BIM) with handheld laser scanners; and c) Geospatial mapping for construction automation; d) Ultra-Wide-Band (UWB) localization for construction site monitoring; e) Geospatial Digital Twins; f) Geospatial VR/AR/MR, g) Geospatial Metaverse.

A variety of teaching activities will be conducted to achieve optimal teaching and learning outcomes. Major teaching activities in this course are:

1. Regular lectures.
2. Workshop case studies.
3. Field work and experiments.
4. Class discussions.

The most important factors in learning are students' commitment and learning methods. You are encouraged to attend all the lectures and other teaching activities. In addition, relevant resources on the web (visit the course website for details) are of great help in understanding the basic concepts discussed in the lectures and the trends in the discipline of surveying and geospatial engineering, including modern positioning/mapping, navigation and timing technologies.

Based on some studies by a higher education research expert John Biggs, most active students in the class do not just listen, see, collect notes and take notes, but most importantly, they will *"express understanding; raise issues, speculate, solve problems, discuss, answer questions and reflect"*. Students are strongly encouraged to do sufficient preparation for class discussions on selected topics.

An example of the approaches to learning is:

Private Study	• Review lecture material and textbook • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Lectures	• Find out what you must learn • See methods that are not in the textbook • Hear announcements on course changes and find out what you must learn • Follow worked examples
Workshops	• Be guided by Lecturer/Demonstrator • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Field Work	• Hands-on work, to test the project design, and to set studies in context

Additional Course Information

Pre-requisites: GMAT3100, GMAT3220, GMAT3500, GMAT3700

At UNSW, normal workload expectations for each program are a minimum of 25 hours per term per unit of credit, including class contact hours, preparation and time spent on all assessable work. For each hour of contact it is expected that you will put in at least 1.5 hours of self-centred and self-directed study: for example, reading the course related materials provided through the course website and reflect on the conceptual framework discussed in the classes and workshops.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Presentation on Research Issues	15%	24/02/2022 06:00 PM	2, 4, 8
2. Report on Research Problem and Literature Review	20%	14/03/2022 06:00 PM	1, 2, 5
3. Presentation on Research Case Study	15%	04/04/2022 06:00 PM	4, 6, 8
4. Research Proposal	50%	26/04/2022 06:00 PM	1, 2, 3, 4, 5, 6, 7, 8

Assessment 1: Presentation on Research Issues

Start date: 28/02/2022 02:00 PM
Assessment length: 10 slides for a class discussion presentation of 8-10 minutes
Submission notes: Draft presentation slides are submitted on 24/2/2022 at 6pm for feedback
Due date: 24/02/2022 06:00 PM

This is the first one of two class presentations in this course. Each student will prepare an individual class presentation on self-selected 2 potential research topics to be considered in the thesis research project in GMAT4060 and GMAT4061. Such presentation will be based on literature review in the first two weeks, focusing on the brief description of the research topics, articulation on relevance of the selected research topics, and feasibility analysis. The detailed marking scheme will be provided together with the class presentation instructions in Week 1.

Assessment 2: Report on Research Problem and Literature Review

Start date: 14/03/2022 06:00 PM
Assessment length: 6-8 pages
Due date: 14/03/2022 06:00 PM

Each student will submit a report containing the research problem statement and literature review. The research problem statement should include brief background information for the topic area. Literature review is a critical part of any research project or engineering design process. It is expected that the most significant areas of literature relevant to the proposed thesis project topic are reviewed, analysed and documented in a former manner to show the historical development, major contributions, current status as well as the future trends in the project topic areas. **The detailed marking scheme will be provided together with the instructions on the report in Week 2.**

Assessment 3: Presentation on Research Case Study

Assessment length: 8-10 slides for a class discussion presentation of 8-10 minutes
Due date: 04/04/2022 06:00 PM

Each student will present the case studies around the self-selected research topic area. Such case study

may be based on designed experiments, collected data sets and relevant software packages available to get initial understanding of the research issues. Such presentation will be the summary of individual research activities over the previous weeks of investigation, laying a solid foundation for the research proposal. The detailed marking scheme will be provided together with the instructions on the presentation in Week 5.

Assessment 4: Research Proposal

Assessment length: 30-35 pages
Due date: 26/04/2022 06:00 PM

Each student will submit a report on the research proposal containing the updated problem statement and literature review, research project plan and methodology, expected research outcomes, and initial case study result and analysis.This report (50%) will be assessed based on the following criteria: a) Written presentation (5%); b) Research project statement (5%); c) Literature review (5%); d) Research plan (15%), e) Initial case studies including field notes and computations (10%); f) In-depth discussions on relevant issues (5%), g) Formatted references (5%).

Attendance Requirements

The students are expected to attend >85% of the lectures, workshops and other teaching activities scheduled in this course.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 14 February - 18 February	Lecture	Course outline; Introduction to research training; Research topics
	Workshop	Case studies on literature search on selected research topics
Week 2: 21 February - 25 February	Lecture	Research issues; Best professional practices; Formulation of a research problem statement
	Workshop	Search and analysis of relevant literature on research issues and best practices
	Assessment	Presentation on Research Issues: Draft presentation slides are submitted on 24/2/2022 at 6pm for feedback
Week 3: 28 February - 4 March	Lecture	Analysis of research problem statements
	Workshop	**Individual presentations on research issues**
Week 4: 7 March - 11 March	Lecture	Research Planning and Methodolgy
	Workshop	Case study: Research on distrorical developments in the SP1-Standard for the Australian Survey Control Network Special Publication
Week 5: 14 March - 18 March	Lecture	The time slot is rescheduled for fieldwork and data collection
	Workshop	Data collection and analysis for case studies **Submission of Individual Report** on Research Problem Statement and Literature Review
	Assessment	Report on Research Problem and Literature Review
Week 6: 21 March - 25 March	Fieldwork	Research data collection (No classes)

Week 7: 28 March - 1 April	Lecture	Statistical analysis in surveying and geospatial engineering
	Workshop	Programing with Matlab for research case studies
Week 8: 4 April - 8 April	Lecture	Framework of research proposal; Ethical framework and research integrity
	Workshop	Data analysis for case studies
	Assessment	Presentation on Research Case Study
Week 9: 11 April - 15 April	Lecture	The time slot is rescheduled for fieldwork and data collection
	Workshop	**Presentation** on research case study
Week 10: 18 April - 22 April	Homework	Revision of research proposal
Study Week: 25 April - 28 April	Homework	**Submission of research proposal (6pm, 26 April 2022)**
	Assessment	Research Proposal

Resources

Prescribed Resources

Materials from previous GMAT courses that you have studied.

The Power Point lecture slides are available for download as PDF files at the course website.
Electronic resources on the lecture topics are available at the course website.
The class notes, latest journal articles and references related the course topics will be referred to and/or distributed during the lectures.

Locus Charter: Principles to support ethical and responsible practice when using location data https://ethicalgeo.org/locus-charter/

Recommended Resources

a) Writing Skills Support at UNSW: https://student.unsw.edu.au/writing
b) Computer software relevant to this course and available in the School's computer lab CE611/201, includes: Matlab or MicroSoft Excel, which will be used for data analysis for thesis research activities.

Course Evaluation and Development

Students are encouraged to engage into all the teaching activities, and the feedback from students on any aspects of the course is always welcome. There will be regular chats with individual or groups of students, to deal with any potential difficulties in learning. As a small class, we have all the advantages to collect feedback and address any concerns in a timely manner.

Laboratory Workshop Information

Surveying and mapping equipment from our store CE G7.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

Academic Information

Final Examinations:

Final exams in T1 2022 will be held online between 29th April - 12th May inclusive, and supplementary exams between 23rd - 27th May inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Refer to Academic Advice on the School website available at: https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Image Credit

Mike Gal.

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	