School of Electrical Engineering & Telecommunications

UNSW Engineering

ELEC4951

Research Thesis A

Term 3, 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Aron Michael	a.michael@unsw.edu.au	Monday 4:00-4:30pm	G17, 316	02 93855663

School Contact Information

Consultations: Lecturer consultation times will be advised during the first lecture. You are welcome to email the tutor or laboratory demonstrator, who can answer your questions on this course and can also provide you with consultation times. ALL email enquiries should be made from your student email address with ELEC/TELExxxx in the subject line; otherwise they will not be answered.

Keeping Informed: Announcements may be made during classes, via email (to your student email address) and/or via online learning and teaching platforms – in this course, we will use Moodle https://moodle.telt.unsw.edu.au/login/index.php. Please note that you will be deemed to have received this information, so you should take careful note of all announcements.

Student Support Enquiries

For enrolment and progression enquiries please contact Student Services

Web

Electrical Engineering Homepage

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)

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

Course Details

Units of Credit 4

Summary of the Course

Contact Hours

The thesis consists of regular Online meetings with the supervisor, typically about 30 minutes weekly. In addition, the thesis usually involves experimental work and thus requires laboratory assistance from the supervisor and/or technical staff.

Context

This course is normally undertaken in the last year of the BE degree program. Its purpose is for students to undertake directed laboratory and research work on an approved topic under the guidance of an academic supervisor. Student must identify a supervisor and project prior to enrolling in this course.

Course Aims

The thesis provides an opportunity for the student to bring together engineering principles learned over their previous years of study and apply these principles to innovatively solve problems such as the development of a specific design, process and/or the investigation of a hypothesis. Thesis projects must be complex, open-ended problems that allow room for student creativity, and the acquisition, analysis and interpretation of results. There must be multiple possible solutions or conclusions at the outset and sufficient complexity to require a degree of project planning from the student. The thesis requires the student to formulate problems in engineering terms, manage an engineering project and find solutions by applying engineering methods. Students also develop their ability to work in a research and development environment.

The thesis provides a good introduction to work in industry and research and serves as an important indicator of how well students are able to utilize and integrate the knowledge and skills they have learnt throughout their program.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Develop a design or a process or investigate a hypothesis following industry and professional engineering standards.	PE1.2, PE1.3, PE1.5, PE1.6, PE2.1, PE2.2, PE2.3, PE2.4, PE3.1, PE3.3
2. Critically reflect on a specialist body of knowledge related to their thesis topic.	PE1.3, PE1.4, PE3.1, PE3.2
3. Apply scientific and engineering methods to solve an engineering problem.	PE1.2, PE1.3, PE1.5, PE1.6, PE2.1, PE2.2, PE2.3, PE2.4, PE3.3, PE3.5

Learning Outcome	EA Stage 1 Competencies
4. Analyse data objectively using quantitative and mathematical methods.	PE1.2, PE1.3, PE2.1, PE2.2
5. Demonstrate oral and written communication in professional and lay domains.	PE3.1, PE3.2, PE3.3, PE3.4, PE3.5

Teaching Strategies

The course is taught as an individual research project, to develop a level of research skills and autonomy.

Delivery Mode

- One introduction lecture by the course coordinator – to explain thesis requirements, procedures, available resources, and assessment scheme.
- Regular weekly Online meetings between supervisor and student – to discuss and advise on the thesis work.
- Laboratory access throughout the semester – for students to carry out practical design and development work with some assistance from technical staff.

Learning in this course

The thesis gives you the opportunity to take on a project on your own, to produce a self-contained and rounded piece of work and write it up for others to assess and use. While the project is yours alone, you will need to obtain advice, information and assistance from others, for example your supervisor, technical officers responsible for laboratories, or computing and workshop staff.

Before carrying out any research it is important to be aware of what work has been done by other researchers. You can ask your supervisor for assistance with the available resources and how to access them, e.g. IEEE-Xplore on-line database. The Internet has become a major source of information for research activities.

While a majority of the design and synthesis tasks will be carried out in the next two sessions, it is important that you take full advantage of time in the first session to grasp what the underlying problem and challenges are, as well as begin the design and synthesis tasks.

Regular online meetings with your supervisor are important, especially during the early stages when it is important to check that what you are doing is indeed what is required. If you want to contact your supervisor outside a regular Online meeting time, leave a message arranging a time to meet. Pre-arranged consultations are often more effective, check contact details on the School website.

Defining a topic is difficult, but it is probably your most important task. Once you have a clear idea of what is required, you can then analyse the alternative course of actions available for achieving your goal. However, if you have the wrong problem then no amount of brilliant analysis or design will achieve the required objective.

Once you have defined your problem, review what has been achieved before, and list what alternative courses of action or methods of solution are available. Analyse the alternatives and decide which of them is the most appropriate for the task in hand. At this stage you should have a clear idea what you

are going to do and what tasks have got to be performed on the way to achieving your goal.

It is a good idea to draw up a developmental schedule and allocate times for each task and important stages or project milestones. The time duration of each task should be carefully checked to ensure if it is realistic and, in particular, allows sufficient time for tasks that are critical for the success of the project. For example, ordering components or equipment construction by the workshop, access to state-of-the art research facilities may have particularly time implications you need to be well aware of. There may be significant lead time with component delivery. Workshop time is always limited and long delays are frequently experienced and therefore it is important to get drawings to the workshop as soon as possible. Access to research facility often requires laboratory inductions and extensive training. Discuss these issues with your supervisor to draw up realistic and time efficient plan.

Additional Course Information

Credits

This is a 4 UOC, level 4 course. The expected workload is 10 hours per week throughout the term. It is important to note that the weighting of the course is equivalent to 2.1 UOC from the available overall 12 UOC for Thesis course.

Relationship to Other Courses

This is a fourth-year core course for students following a BE (Electrical) or (Telecommunications) program in the EE&T School and other combined degree programs. This course constitutes the first part (Thesis A) of the three-part thesis work (Thesis A, B and C). It involves a detailed literature search and reviews of the background for the chosen topic, familiarisation with the tools or equipment required for the project, some preliminary design/developmental work, and formulation of a research plan. This prepares the student for the detailed project work that will be undertaken in Thesis B and C in the following subsequent two terms.

Pre-requisites and Assumed Knowledge.

The pre-requisite for this course is completion of 126 UOC and third year core courses.

Following Courses

The course is a pre-requisite for ELEC4952 which must be taken in the immediately following term.

Assessment

Assessment is based on evaluating the student's work through the interim report (57%) and online seminar (43%). The assessment will be carried out by the thesis supervisor and the thesis assessor whose marks are equally weighed. The assessor is an academic staff assigned by the School. The same assessor will be assigned for Thesis C. The marking is done independently by each marker, without collusion or knowledge of the other mark. If there is a significant difference between the two marks for the report (>10%), the Thesis Coordinator has the discretion to decide the next course of action, e.g. ask the two markers to review their marks.

It is intended that Thesis A covers the planning, preparing and completing some initial work on the project. To measure these achievements through the report and online seminar, the marking breakdowns are: (i) 50% on gathering, understanding and prioritizing relevant technical background about the project, literature review and the problem statement; (ii) 20% on project planning (proposed solution or methodology, project timeline, identification of resources and skills; (iii) 20% on project preparation (skills acquired, training completed, preliminary results, risk assessment) and (iii) 10% on the presentation.

It is most important to note that Thesis A is not just about doing a literature review, but students must demonstrate real progress in the project with tangible project deliverables.

Policy for lateness

The penalty is detailed below:

- For thesis seminar – zero (0) mark is awarded
- For thesis report – 5 marks off the *thesis* for every day late. Penalty applies until the marks for the *course* decrease to 50, and further lateness does not result in failure of the *course*, but might be a failure of the thesis (weekends count as days). Any thesis report not turned in within 6 weeks after the deadline will be finalised at zero (0) marks.

In all cases, applications for late submission can be applied for BEFORE the due date. This is at the discretion of the thesis coordinator, but should only be granted in exceptional circumstances. As per normal, students can also apply through myUNSW for special consideration.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Interim report	57%	18/11/2021 12:00 PM	1, 2, 3, 4, 5
2. Seminar presentation	43%	Not Applicable	2, 4, 5

Assessment 1: Interim report

Assessment length: 20 - 25 pages
Submission notes: Students first submit their report for the Turnitin check. Once the similarity is below 15%, they then submit their report using workshop tool.
Due date: 18/11/2021 12:00 PM

A written report is to be submitted in **week 10 (Thursday 12pm)**, by uploading the report as one single pdf formatted file. This file should include, as the first page, a scanned image of the report cover sheet. The report cover sheet can be downloaded from the course web site. The report must also include an Appendix for a scanned copy of the completed Risk Assessment Form. If using double space and size 12 font, a typical report is about 15 to 25 pages (including: graphs, figures, diagrams, attached forms).

The report should contain the following elements:

- Abstract / Table of contents / Introduction / Body / Conclusion.
- Project definition, which includes the problem statement, and motivation for trying to solve this particular problem, possible solutions to the problem along with their pros and cons and challenges.
- Literature review.
- Description of preliminary work – although much of the design and synthesis will be carried out in Thesis B, it would be expected that preliminary work would be carried out in Thesis A.
- Time outline for tasks planned in Thesis B and C. This should be more than just a simple Gantt chart and include a description of the work required to be carried out in Thesis B and C. Also include possible perceived problems or risks you may encounter which could change the schedule and planned work.

The report must be individually written even for cases where a group of students work on the same topic.

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

Assessment criteria

The assessment criteria are

Reviewing work of others (50%)

Problem statement; hypothesis and aims; literature review (comprehensive, up-to-date, critical assessment of existing work).

Project planning and work completed (40%)

Articulating research question; ability to apply logical thinking in gathering information, analyzing available information, formulating plans, proposing solutions; thesis outline; preliminary work already completed like simulations, solving simpler sub-problems or becoming skilled in the use of relevant tools.

Document presentation (10%)

Physical presentation (report structure, legibility, layout); quality of writing (grammar, spelling, wording, style, clarity, adequately proofread); referencing (fully documented reference list, using correct citation conventions); report self-contained, (provide all information needed).

Additional details

Reviewing work of others (50%)

Marking guide:

0-49: Deficient

50-64: Adequate

65-74: Solid

75-84: Solid and linked

85-100: Of review paper quality

Project planning and work completed (40%)

Marking guide:

0-49: Broad context missing

50-64: Broad context present. No specific plan

65-74: Broad context present. Specific logical plan

75-84: Broad context present. Specific logical plan. Plan fits the review narrative. Completion of preparatory work for the project.

85-100: Broad context present. Specific and robust logical plan. Plan fits the review narrative. Well into execution of the main project with actual completion of some initial tasks.

Document presentation (10%)

Marking guide:

0-49: Impedes document reading

50-64: Poor formatting/document structure

65-74: Poor judgment with respect to layout, possible padding

75-84: Professional, may have issues with data presentation

85-100: Professional, concise and readable

Assessment 2: Seminar presentation

During **week 8 (or week 9 depending on scheduling)**, you are required to give an online seminar presentation describing your work on the topic.

Student online seminars will take place online using MS Teams at the times agreed between the students and their markers. The duration of each online seminar will be 30 minutes. Plan your presentation to last for about 20 minutes plus 7 minutes for answering questions and 3 minutes for the changeover. Go at a steady pace. Practice the right emphasis and timing. Rehearsals will give you

confidence and remove some of the nervousness.

Technical skill is very important; but just as important is the ability to talk about your work in an informative and convincing way. The online seminar provides the opportunity both to inform and to demonstrate your communication skills. Your talk should be addressed both to your examiners who will need to know details about your progress with the topic, and to students and staff members having a more general interest in the project.

The thesis seminar might have the following outline:

- Thesis definition, i.e. what is the problem you are trying to solve including motivation.
- Background and literature review
- Description of preliminary work (e.g. simulation, modeling, experimental procedure)
- Outline and timetable schedule for work in Thesis B and C in the following terms.

PowerPoint slides or Acrobat PDF for presentation are recommended.

Assessment criteria

The marking is based on 5 assessment criteria: subject matter (30%), preliminary work and plan (25%), quality (15%), presentation (15%), and question handling (15%).

Additional details

Subject matter:

Context of problems and underlying theory, possible solutions and reasons for choice made, difficulties to be overcome, relations to published work, etc

Marking guide:

0-49: Deficient – trivial or of sub-standard engineering value

50-64: Adequate – straightforward, require only basic engineering skills to solve problem

65-74: Good – challenging problem, require a fair amount of disciplinary knowledge and skills

75-84: Very good – very challenging problem, require in-depth disciplinary knowledge and skills

85-100: Excellent – highly-challenging problem, require in-depth disciplinary knowledge, acquire new skills or interdisciplinary knowledge

Quality:

Quality of thesis work revealed by seminar, degree of challenge, innovation.

Marking guide:

0-49: Deficient, poor – fundamental deficiencies in one or more critical aspects of the work

50-64: Adequate – one or more major deficiencies; work is marginal technically

65-74: Good – one or more significant deficiencies but overall work is sound

75-84: Very good – professional, only one or more minor deficiencies

85-100: Excellent – all aspects of the work exhibit impeccable scholarship

Preliminary work and plan:

Project planning, skills (including resources and training required) identified and acquired, and preliminary results revealed by seminar

Marking guide:

0-49: Deficient, poor – no evidence of project planning or identification of skills (including resources and training)

50-64: Adequate – some evidence of project planning and identification of skills (including resources and training)

65-74: Good – good evidence of project planning and acquiring skills (including resources and training)

75-84: Very good – high evidence of project planning and acquiring skills (including resources and training)

85-100: Excellent – demonstrated well thought project planning and significant preliminary results

Presentation:

English usage, rate of speech and audibility, clarity of description and relevance, use of aids, platform manner, logical structure of the presentation, quality of summary sheet.

Marking guide:

0-49: Poor visual and oral dissemination; you are left unsure what the work is about

50-64: Adequate, able to articulate the problem or concept involved in the work

65-74: Good storytelling with use of graphics, images, facts, data, etc.

75-84: Professional presentation; audience gets a clear understanding about the work

85-100: Excellent, high impact, engaging, audience will long remember

Question handling:

Degree of competence in answering the questions.

Marking guide:

0-49: Unable to answer questions or attempt to answer but clearly doesn’t really understand

50-64: Able to answer questions but there are flaws. Nevertheless, you are fairly sure they understand what they're doing

65-74: Able to answer questions with only minor flaws; you are sure they have reasonably good understanding about their work

75-84: Able to answer questions easily and directly, almost flawless

85-100: In-depth flawless answers that demonstrate commanding knowledge of the subject

Attendance Requirements

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

Course Schedule

Period	Activity
	▪ Prior to start of the term, student selects thesis topic and gets approval from supervisor. ▪ Weekly Online meetings during the term with supervisor for technical guidance on thesis work ▪ Laboratory work during the term subject to arrangement with technical staff
Week 1	▪ Overview of thesis work - Introductory talk by Thesis Coordinator ▪ 4pm Friday: deadline for registering your thesis topic and supervisor name via Moodle portal 'EET School Thesis/Project'
Week 1-2	Provide Thesis details for each assessment via the Moodle course page 'ELEC4951/9451-Research Thesis A/Masters Project A T3 2021' ▪ For start, provide general thesis topic, your name and supervisor's name urgently. Thesis topic can be updated at this till week 8. ▪ The details should be provided for each assessment. In this course, the assessments are PART A SEMINAR ASSESSMENT and PART A REPORT ASSESSMENT. ▪ To provide the details for PART A SEMINAR ASSESSMENT, follow the steps below. ◦ Go to Thesis A Seminar (click to expand the section) ◦ Click on PART A SEMINAR ASSESSMENT and follow the prompt. ▪ To provide the details for PART A REPORT ASSESSMENT, follow the steps below. ◦ Go to Thesis A Report (click to expand the section) ◦ Click on PART A REPORT ASSESSMENT and follow the prompt
Week 2	▪ Thesis guide – Online seminar by Prof. Victor Solo
Week 5	▪ Risk Management Form completed and approved by supervisor. ▪ If applicable, ethics approval required from relevant authority
Week 8-9	▪ Online Seminars, schedules to be announced during Week 7
Week 10	▪ 12pm Thursday: deadline for submission of your report via Moodle.

Resources

Prescribed Resources

Recommended text(s):

Reading materials are specified by the supervisor (related to particular thesis topic).

On-line resources

Moodle

As a part of the teaching component, Moodle will be used to disseminate materials, host forums: https://moodle.telt.unsw.edu.au/login/index.php. All information about this course is available from this link which is regularly updated.

Mailing list

Announcements concerning course information will be given on Moodle and/or via email (which will be sent to your student email address).

ADDITIONAL INFORMATION ABOUT THE THESIS

How to nominate a thesis topic

The Moodle portal 'EET School Thesis/Project' helps you find a supervisor and register a thesis topic to work on. Preferably, this should be done well before the start of the semester. Follow these steps:

- Go to https://moodle.telt.unsw.edu.au/course/view.php?id=20890 and enrol yourself as a student; the self-enrolment key is EETTPstudent.
- From here, you can view the research profiles of prospective supervisors and topics by clicking on the 'Research Topics' icon. Please note that the topics list is only indicative and may not show all the topics available. Supervisors may have other new topics in mind or you may want to propose your own topic that matches the supervisor' interests and expertise.

When you have found a supervisor with a topic that suits your interests, you are required to contact this person to discuss your intention. If you both agree to team up, ask the supervisor to email you to confirm approval of the topic title. You can then proceed to register your topic:

- Go into Moodle 'EET School Thesis/Project', click 'Select Your Supervisor' icon then click 'Select Supervisor'. Find your supervisor name and click the action box to become a member.
- From the home page, click 'Select Your Supervisor' icon then click 'Register Topic', 'Add Entry' and enter your details and topic title.
- You now have formally secured a supervisor with a specific topic to work on in the forthcoming semester. Furthermore, you must enrol in the appropriate thesis course code on myUNSW, as you would normally enrol in other courses. This will give you access to the main Moodle for this course: ELEC4951/9451 - Research Thesis A/Masters Project A-2021 T3.

Risk Management

Your thesis work may involve practical experiments in the laboratory or only using office computers. Regardless of the nature of your thesis work, you must do a risk assessment before commencing. The *Risk Management Form* has to be **completed, approved by your supervisor and attached as an appendix** to the Thesis A report. If applicable, also attach appropriate ethics approvals as an appendix. Please refer to the UNSW Health & Safety website for information on how to complete a Risk Management Form, and on risks associated with certain tasks. If you are having trouble navigating the website, please contact the School's Health & Safety Advisor, Emilio Saliba.

For access requirements to Labs and offices, please click HERE and follow the instructions as soon as possible.

Academic Honesty and Plagiarism

Academic Honesty and Plagiarism

Plagiarism is the unacknowledged use of other people's work, including the copying of assignment works and laboratory results from other students. Plagiarism is considered a form of academic misconduct, and the University has very strict rules that include some severe penalties. For UNSW policies, penalties and information to help you avoid plagiarism, see https://student.unsw.edu.au/plagiarism. To find out if you understand plagiarism correctly, try this short quiz: https://student.unsw.edu.au/plagiarism-quiz.

General Conduct and Behaviour

Consideration and respect for the needs of your fellow students and teaching staff is an expectation. Conduct which unduly disrupts or interferes with a class is not acceptable and students may be asked to leave the class.

Academic Information

COVID19 - Important Health Related Notice

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.

If you are required to self-isolate and/or need emotional or financial support, please contact the Nucleus: Student Hub. If you are unable to complete an assessment, or attend a class with an attendance or participation requirement, please let your teacher know and apply for special consideration through the Special Consideration portal. To advise the University of a positive COVID-19 test result or if you suspect you have COVID-19 and are being tested, please fill in this form.

UNSW requires all staff and students to follow NSW Health advice. Any failure to act in accordance with that advice may amount to a breach of the Student Code of Conduct. Please refer to the Safe Return to Campus guide for students for more information on safe practices.

Dates to note

Important Dates available at: https://student.unsw.edu.au/dates

Student Responsibilities and Conduct

Students are expected to be familiar with and adhere to all UNSW policies (see https://student.unsw.edu.au/policy), and particular attention is drawn to the following:

Workload

It is expected that you will spend at least **15 hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both formal classes and *independent, self-directed study*. In periods where you need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a common source of failure for many students. You should take the required workload into account when planning how to balance study with employment and other activities.

Attendance

Regular and punctual attendance at all classes is expected. UNSW regulations state that if students attend less than 80% of scheduled classes they may be refused final assessment.

Work Health and Safety

UNSW policy requires each person to work safely and responsibly, in order to avoid personal injury and to protect the safety of others.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You can apply for special consideration when illness or other circumstances beyond your control interfere with an assessment performance. If you need to submit an application for special consideration for an exam or assessment, you must submit the application **prior to the start** of the exam or before the assessment is submitted, except where illness or misadventure prevent you from doing so. Be aware of the "fit to sit/submit" rule which means that if you sit an exam or submit an assignment, you are declaring yourself well enough to do so and cannot later apply for Special Consideration. For more information and how to apply, see https://student.unsw.edu.au/special-consideration.

Administrative Matters

On issues and procedures regarding such matters as special needs, equity and diversity, occupational health and safety, enrolment, rights, and general expectations of students, please refer to the School and UNSW policies:

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

https://www.engineering.unsw.edu.au/electrical-engineering/resources

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	