

1. Course Staff

Thesis supervisor: To be nominated by the student (together with thesis topic)
 Thesis coordinator: A/Prof. Toan Phung, Room EE107, toan.phung@unsw.edu.au

Consultations: About the thesis work, technical inquiries should be directed to the thesis supervisor whereas general administrative inquiries should be directed to the thesis coordinator. ALL email enquiries should be made from your student email address with ELEC4120 (or TELE, PHTN) in the subject line; otherwise they will not be answered.

Keeping Informed: Announcements may be made 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.

2. Course Summary

Contact Hours

The thesis consists of regular 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 and Aims

This course is normally undertaken in the second last semester 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. Generally, the thesis involves the design and construction of experimental apparatus, software simulations or models with laboratory tests.

The thesis is a good introduction to work in industry and research, and is an important indicator of how well students are able to utilize and integrate the knowledge and skills they have learnt throughout their program. It also plays an important role in the final grading of degrees.

Schedule

Period	Activity
	<ul style="list-style-type: none"> ▪ Prior to start of semester, student selects thesis topic and gets approval from supervisor. ▪ Weekly meetings during the semester with supervisor for technical guidance on thesis work ▪ Laboratory work during the semester subject to arrangement with technical staff

Week 1	<ul style="list-style-type: none"> ▪ Overview of thesis work - Introductory talk by Thesis Coordinator ▪ 4pm Friday: deadline for return of "Topic Nomination Form" to EE&T Sch. Office
Week 7	<ul style="list-style-type: none"> ▪ Risk Assessment Form completed and signed off by supervisor ▪ If applicable, ethics approval required from relevant authority
Week 11-12	<ul style="list-style-type: none"> ▪ Seminars, location and time to be announced during Week 10 ▪ Apart from their own presentations, students are required to attend at least six other seminars as a compulsory requirement for satisfactory completion of Thesis A.
Week 13	<ul style="list-style-type: none"> ▪ 12pm Thursday: deadline for return of "Seminar Attendance Form" to EE&T School Office ▪ 12pm Thursday: deadline for submission of the report, submit on-line

Assessment

- | | |
|------------|---------------|
| 1. Seminar | 25% weighting |
| 2. Report | 75% weighting |

3. Course Details

Credits

This is a 6 UOC, level 4 course. It is important to note that in the WAM (Weighted Average Mark) calculation for awarding Honours degree, the weighting applied makes it equivalent to 4.5 UOC, level 4. The expected workload is 10–12 hours per week throughout the 13 week semester.

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 of the two-part thesis work (parts A and B). Thesis A 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/development work, and formulation of a research plan. This prepares the student for the detailed project work undertaken in Thesis B in the following semester.

Pre-requisites and Assumed Knowledge

The pre-requisite for this course is ELEC/TELE/PHTN3117 and 120 units of credit.

Following Courses

The course is a pre-requisite for ELEC/TELE/PHTN4121 which must be taken in the immediate following semester.

Learning outcomes

Overall, at the end of the course students should:

1. Have gained a clear understanding of what the problem is that they are trying to solve, as well as the challenges in implementing the solution.
2. Have developed detailed background knowledge of the chosen topic area as a basis for developing their own ideas and program of work in Thesis B.

3. Know the general infrastructure requirements of engineering projects including laboratory, workshop, computing facilities, information systems and OHS requirements.
4. Have gained an appreciation of the role of thesis supervisors play in quality assurance.
5. Deliver a professional seminar presentation and a written report on their chosen research topic outlining the motivation, background and selected research methodology that will be used in Thesis B.
6. Successfully proceed on to the design and synthesis tasks of thesis B for their chosen research topic.

This course is designed to provide the above learning outcomes which arise from targeted graduate capabilities listed in **Appendix A**. The targeted graduate capabilities broadly support the UNSW and Faculty of Engineering graduate capabilities (listed in **Appendix B**). This course also addresses the Engineers Australia (National Accreditation Body) Stage I competency standard as outlined in **Appendix C**.

Syllabus

The thesis project topic area chosen by the student may be in any technical area covered by the interests and expertise of the academic staff of the EE&T School who will act as the project supervisors. A list of topics offered by the school is published each year and can be viewed on the School thesis/project database web site. Students are to make their own selection. Usually, the topic chosen is influenced by the students' future career directions. Note that some topics offered on the list are of a general nature, requiring the topic to be defined in discussion with the supervisor. Many topics can be modified to cater for specific student interests. There is provision for 'wildcard' topics nominated by students or industry. However, it is required to find an academic staff who can recognize the technical merits and is prepared to act as a supervisor (or co-supervisor) of such a topic.

In addition to the key elements of problem analysis and synthesis, the course requires information literacy, revision and explicit application of project management concepts, safety considerations, and risk mitigation. The assessment includes both written and oral communications – the students will deliver professional seminar presentations on their chosen research topic outlining the motivation, background and selected research methodology that will be employed in Thesis B.

4. Teaching Strategies

Delivery Mode

- One introduction lecture by the course coordinator – to explain thesis requirements, procedures, available resources, and assessment scheme.
- Regular weekly 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 second session, 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 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 meeting time, leave a message arranging a time to meet. Pre-arranged consultations are often more effective. Contact details are on the School website: <http://www.engineering.unsw.edu.au/electrical-engineering/academic-staff-list>

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 courses of action 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 development 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 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 if equipment is constructed, get the drawings to the workshop as soon as possible. Workshop time is always limited and long delays are frequently experienced. Discuss what you want with the workshop staff with the aim of simplifying your design or modifying existing items.

5. Assessment

Assessment is based on evaluating the student's work through the interim report (75%) and seminar (25% weighting). 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 B. 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 seminar, the marking breakdowns are: (i) 65% on gathering, understanding and prioritising relevant technical background about the project, literature review and the problem statement; (ii) 25% on project deliverables (detailed proposed solution or design, work plan with specific tasks for

realizing this solution, and which tasks completed to date) and their quality (degree of challenges involved, level of intellectual contribution); 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.

Relationship of Assessment Methods to Learning Outcomes

Assessment	Learning outcomes					
	1	2	3	4	5	6
Thesis seminar	✓	✓	✓	✓	✓	✓
Written report	✓	✓	✓	✓	✓	✓

6. Course Resources

Recommended text(s):

- UNSW Learning Centre, Thesis Writing Guide.
<http://www.lc.unsw.edu.au/thesis/index.html>
- <http://www.library.unsw.edu.au/servicesfor/students.html>
- Others to be specified by 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. Also, the same content can be accessed on the School web-site: <http://www.engineering.unsw.edu.au/electrical-engineering/4th-year-thesis>.

Mailing list

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

7. Additional Information about the thesis

How to nominate a thesis topic

The EE&T thesis database lists all the current thesis topics that can be taken by students. It can be found on the course web site. Once you have found a topic you want to do, you need to negotiate with the supervisor of that topic to accept you. As a formal requirement, the *Topic Nomination Form* must be completed, signed by you and your supervisor, and handed in to the School Office. Preferably, this should be done well before the start of the semester.

What to do

Before commencing your thesis work, you are required to perform a risk assessment of the work involved. The *Risk Assessment Form* has to be completed and signed off by you and your supervisor. Remember to attach this document to your submitted thesis report and also, if applicable, ethics approval record.

Thesis seminar

During **week 11 (or week 12 depending on scheduling)**, you are required to give a Seminar presentation describing your work on the topic.

Student seminars will take place at the times given in the Timetable at locations to be advised. The duration of each seminar will be 30 minutes. Plan your presentation to last about 20 minutes plus 7 minutes for answering questions and 3 minutes for the changeover. By this stage you will be knowledgeable in your topic, but you should present the materials so that it can be understood by the other students attending your seminar. 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 seminar provides the opportunity both to inform and to demonstrate your communication skills. Your talk should be addressed both to your examiners (supervisor and assessor) 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 in the following semester.

PowerPoint slides or Acrobat PDF for presentation on a data projector are recommended. Presenters bring their files stored in a USB memory stick. Alternatively, you can bring your own laptop.

The student giving the seminar must bring along ~20 printed copies of the "Summary Sheet" for distribution to the audience. This one-page handout contains your thesis title, your name and student ID, thesis aim and objectives, background, your solution to the problem.

You are also required to be the chairperson for the seminar that follows yours in the same room even if it takes place on the following day (note: seminars may be run in several locations). This is compulsory and students must ensure that they perform this duty. See "Advice for Chairpersons and Speakers" document on the course web site.

In addition to your own oral presentation, you are required to attend at least six seminar sessions given by other students. You are required to keep a record of the seminars attended on a *Seminar Attendance Form*. For verification, each attendance must be signed off by a member of the academic staff who is present at the seminar. You need to have your form signed BEFORE you leave the seminar room. Keep this sheet until you have attended 6 seminars, then hand it in to the EE&T School Office by **12pm (noon) Thursday of week 13**.

Written report

A written report of about 5000 words is also required. This is to be submitted in **week 13 (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 (everything included: graphs, figures, diagrams, attached forms).

As with the seminar, the preliminary report should have the following elements:

- Abstract / Table of contents / Introduction / Body / Conclusion (these do not necessarily constitute Chapter titles).
- 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.
- Outline and timetable schedule for work in Thesis B in the following semester. This should be more than just a simple Gantt chart. This should include a description of the work required to be carried out in Thesis B, and 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. To upload your report, access "My EE&T Account" via the School web site:

<http://www.engineering.unsw.edu.au/electrical-engineering/undergraduate-information>

and then log in with your student ID and unipass.

If Things Go Wrong

If you start having serious problems, don't ignore them or stop working; the problems won't go away. Talk over your worries with your supervisor to see what you can do to get going again. If you are still not able to resolve the problems, then see the Thesis Coordinator, the Director of Academic Studies in EE&T or the Student Counseling and Careers Unit. The Learning Centre also offers advice and support on these matters. Often some advice or perhaps reducing the scope of the project can get you working effectively for the rest of the year.

8. Other Matters

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>.

In 2014, there were several instances of plagiarism in courses with thesis or project report submissions. The most common penalty was **failure** of the course. If you don't understand what plagiarism is, please act now to educate yourself.

Student Responsibilities and Conduct

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

Workload

It is expected that you will spend at least **ten to twelve hours per week** studying a 6 UoC course, from Week 1 until the final assessment, including both face-to-face meetings with your supervisor and *independent, self-directed study*. In periods where you need to need to complete assignments or prepare for assessments, 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.

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.

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.

Ethics approval

The thesis work may require ethics approval. Does your thesis involve other people doing something for you? If so, it may require ethics approval. The basic principle is that if you want people to provide you with something, even if just 5 min of their time to answer questions, then you should (i) treat them with suitable dignity and (ii) ensure any possibility that they may be badly affected is absolutely minimised. When research at UNSW involves people, then it comes under the oversight of the UNSW Ethics Committee which must give approval before it proceeds.

You will need to get approval, if your project involves any of the following (more than one may apply):

- a survey, even if done on-line
- an interview, focus group, or other such "qualitative" method
- data-mining, when individual identities might be revealed
- behavioural observation, e.g. people using something, choices people make, on-line activities
- recording or photography of people, even if in public spaces

- experiments on human reactions (or other abilities)
- human performance, e.g. running, falling, playing music
- testing a device
- tasting or smelling, e.g. foods
- and, of course, drug trials, body tissues and other medical activities.
- experiments on animals

If your project does require approval, in the first instance, discuss this with your supervisor.

Special Consideration

You must submit all assignments and attend all assessments scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress. All applications for special consideration must be **lodged online through myUNSW before the assessment event**, not to course or school staff. For more detail, consult <https://student.unsw.edu.au/special-consideration>.

Continual Course Improvement

This course is under constant revision in order to improve the learning outcomes for all students. Please forward any feedback (positive or negative) on the course to the course convener or via the Course and Teaching Evaluation and Improvement Process. You can also provide feedback to ELSOC who will raise your concerns at student focus group meetings. As a result of previous feedback obtained for this course and in our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

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:

<http://www.engineering.unsw.edu.au/electrical-engineering/policies-and-procedures>

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

Appendices

Appendix A: Targeted Graduate Capabilities

Electrical Engineering and Telecommunications programs are designed to address the following targeted capabilities which were developed by the School in conjunction with the requirements of professional and industry bodies:

- The ability to apply knowledge of basic science and fundamental technologies;
- The skills to communicate effectively, not only with engineers but also with the wider community;
- The capability to undertake challenging analysis and design problems and find optimal solutions;
- Expertise in decomposing a problem into its constituent parts, and in defining the scope of each part;
- A working knowledge of how to locate required information and use information resources to their maximum advantage;
- Proficiency in developing and implementing project plans, investigating alternative solutions, and critically evaluating differing strategies;
- An understanding of the social, cultural and global responsibilities of the professional engineer;
- The ability to work effectively as an individual or in a team;
- An understanding of professional and ethical responsibilities;
- The ability to engage in lifelong independent and reflective learning.

Appendix B: UNSW Graduate Capabilities

The course delivery methods and course content directly or indirectly addresses a number of core UNSW graduate capabilities, as follows:

- Developing scholars who have a deep understanding of their discipline, mostly through self-study with little guidance from staff.
- Developing rigorous analysis, critique, and reflection, and ability to apply knowledge and skills to solving problems encountered in the course of thesis work.
- Developing capable independent and collaborative enquiry, through self-study and information gathering spanning the duration of the course.
- Developing digital and information literacy and lifelong learning skills through the literature review and selective gathering of background technical information required for the project.
- Developing ethical practitioners who are collaborative and effective team workers, through group activities, seminars.
- Developing independent, self-directed professionals who are enterprising, innovative, creative and responsive to change, through challenging design and project tasks.
- Developing citizens who can apply their discipline in other contexts, are culturally aware and environmentally responsible, through interdisciplinary tasks, seminars and group activities.

Appendix C: Engineers Australia (EA) Professional Engineer Competency Standard

	Program Intended Learning Outcomes	
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals	✓
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing	✓
	PE1.3 In-depth understanding of specialist bodies of knowledge	✓
	PE1.4 Discernment of knowledge development and research directions	✓
	PE1.5 Knowledge of engineering design practice	✓
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice	
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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	✓
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability	✓
	PE3.2 Effective oral and written communication (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	