UNSW SYDNEY | Australia's Global University

Photovoltaic and Renewable Energy Engineering

Course Outline

Term 3 2020

SOLA 4952/9452

RESEARCH THESIS B

Contents

Staff contact details

Contact details and consultation times for course convenor

Name: Dr Merlinde Kay
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For appointments, questions and consultation please email to arrange a time.

Contact details and consultation times for additional lecturers/demonstrators/lab staff
Students should stay in contact with their nominated supervisor throughout the three thesis terms, perhaps at a pre-organised weekly meeting time. If a student would like to contact their supervisor outside of a pre-organised weekly meeting, email is the preferred method of contact.

The School would also like to arrange a seminar during thesis B, provided that enough students are interested in attending. The seminar would provide students with information about writing a thesis. Students will be contacted about this in due course.

Please see the course Moodle.

Important links

- Moodle
- Health and Safety
- Student Resources
- UNSW Timetable
- UNSW Handbook
- Engineering Student Support Services Centre
- UNSW Photovoltaic and Renewable Energy Engineering

Course details

Credit points

This is a 4 unit-of-credit (UoC) course.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 6 h/w on this course. The additional time should be spent in making sure that you understand the material, completing the set deliverables, further reading, and planning.

Contact hours

There are no formal lectures for this course. Students should stay in contact with their nominated supervisor throughout the three thesis terms, perhaps at a pre-organised weekly meeting time. It is very important in the early stages of your project to be in contact with your supervisor to ensure that you have a clear understanding of the topic, what is required, and to check that what you are doing is addressing the aims of the project. If a student would like to contact their supervisor outside of a pre-organised weekly meeting, email is the preferred method of contact.

Summary and Aims of the course

The Thesis Project is carried out in the last three terms of the BE program. The course comprises four units of credit in each Term. As a rough guide students are expected to work on their thesis for at least 6 hours per week in each term. During this time students are involved with directed laboratory and research work on an approved topic and under the guidance of members of the academic and research staff. Students may commence the thesis in either term 1, 2 or 3 of an academic year.

The thesis is an opportunity for you to demonstrate what you have learned throughout your studies in PV and RE. It is expected that your research, analytical work, and writing will far exceed the level of work completed in your second year project (UG). The thesis comprises a large portion of student's WAM calculations which is used to assign Honours levels (UG) and to assess APA applications. The School also awards a prize for the best UG thesis in photovoltaics and Renewables every year. For details about this prize, please see the University Calendar.

Student learning outcomes

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.

BE (Hons) Program Learning Outcomes

1. Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
2. Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.
4. Discernment of knowledge development and research directions within the engineering discipline.

5. Knowledge of engineering design practice and contextual factors impacting the engineering discipline.
6. Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline.
7. Application of established engineering methods to complex engineering problem solving.
8. Fluent application of engineering techniques, tools and resources.
9. Application of systematic engineering synthesis and design processes.
10. Application of systematic approaches to the conduct and management of engineering projects.
11. Ethical conduct and professional accountability.
12. Effective oral and written communication in professional and lay domains.
13. Creative, innovative and pro-active demeanour.
14. Professional use and management of information.
15. Orderly management of self, and professional conduct.
16. Effective team membership and team leadership.

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should be able to:
Course Learning Outcomes (mapped to BE Program Learning Outcomes below)
At the conclusion of this course, students should be able to:

1. Develop a design or a process or investigate a hypothesis following industry and professional engineering standards. (7, 8, 9, 10)
2. Critically reflect on a specialist body of knowledge related to their thesis topic. (3)
3. Apply scientific and engineering methods to solve an engineering problem. (7)
4. Analyse data objectively using quantitative and mathematical methods. (2, 7, 8)
5. Demonstrate oral and written communication in professional and lay domains. (12)
6. Complete a risk assessment associated with a project.

Learning Outcome		**EA Stage 1 Competencies**
1.	Critically reflect on a specialist body of knowledge related to their thesis topic	PE1
2.	Apply scientific and engineering methods to solve an engineering problem	PE2
3.	Demonstrate oral and written communication in professional and lay domains	PE3

Teaching strategies

As there are no lectures, below are some thesis guidelines.

Thesis Guidelines

- The prerequisites for Thesis B (SOLA4952/9452) and Thesis C (SOLA4953/9453) are Thesis A (SOLA4951/9451) and Thesis B (SOLA4952/9452), respectively.

- With School/course co-ordinator permission, students may take Thesis B and C together. This option is be limited only to students who can demonstrate the ability to progress. This will require a prerequisite waiver to waive the Thesis B requirement for Thesis C. Students must inform the co-ordinator before they start thesis B.
- Students must take Thesis courses in consecutive terms, unless exceptional circumstances are demonstrated by the student through the standard channels and accepted by the School.
- Thesis A and B will initially carry a 'satisfactory' (EC grade) or 'not satisfactory' (EF grade). A student's final Thesis mark for A, B and C will reflect the overall weighted percentage of marks achieved during all three courses once Thesis C is completed, and the earlier EC grades will be replaced with the final mark at that time.

Course schedule

There are no lectures for this course. A seminar will be given on how to write a thesis at the end of the term. Details will be posted on moodle.

Assessment

Assessment overview

Thesis A: It is intended that Thesis A cover the scoping, planning, and completing preparations for the project.

1. Project Plan – this will comprise a 1-2 page document explaining the justification for their project, a rough layout of a plan of work throughout the project, including any software, methods etc they need to be trained on. (Thesis A)
2. Literature and Progress review– this should comprise the relevant literature and background of the topic, the problem statement and motivation for the work and a detailed research plan. For details of what to include see below in Assessment.

Thesis B: The primary intention behind Thesis B is to ensure students stay on track with their projects and project work as they progress through the year.

1. Progress update – a form on moodle where you update your progress, and talk about any obstacles or changes to your original plan.
2. Seminar Presentation – The seminar should include overall aim of project, intended outcomes, a progress report including a detailed methodology, and preliminary results.
3. Progress Report – this should comprise a thesis table of contents outlining the structure of the thesis. The table of contents should be as close to what you will put into your final report. A 2-5 page summary on goals and tasks accomplished and future work

Thesis C: Thesis C continues the project work. The key deliverable is the Written Report. The following course assessments relate to the student's research planning, conducting the research project and writing the thesis document, and disseminating the results in different forms.

1. Participation – assesses the students commitment and engagement to the project assessed by the supervisor - see participation criteria document. (Assessed over Thesis A, B and C)
2. Final Report – the final thesis document (Thesis C)
3. Dissemination of work – Students will participate in a online 3-minute thesis presentation presenting their work (Thesis C)

Overview of all deliverables is below, specific due dates for each term, as well as the criteria will be found in each terms course outline.

	Assessments	Due Week	Contribution to final mark	Assessed by
Thesis A	1. Submit nomination form	1	Loss of 2% out of 10% participation mark if not submitted	Thesis Co-ordinator
	2. Project Plan	3	Loss of 2.5% out of 10% participation mark if not submitted	Supervisor
	3. Literature and Progress Review	10	10%	Supervisor/Assessor (50/50)
Thesis B*	1. *Progress Update	3	Loss of 2.5% out of 10% participation mark if not submitted	Supervisor

	2. Seminar Presentation 3. Progress Report	7 10	10% 5%	Supervisor/Assessor (50/50) Supervisor
Thesis C	1. Final Report 2. Participation 3. Video	10 10 10	60% 10% 5%	Supervisor/Assessor (50/50) Supervisor Supervisor/Assessor (50/50)

NOTE: For Thesis A,B mark will be EC, and a final mark is given in Thesis C taking into account the breakdown.
* For any student wanting to complete Thesis B and C concurrently, additional assessment criteria will be put in place. It will be expected that any student requesting this will be at the stage of submitting 1. the literature review with preliminary results included. They must be at a DN level for all aspects to be allowed to move to finishing in two terms. 2. the progress report document will be due week 3 of term 2 of thesis, if not at a DN level the student will have to go back down to thesis B only.

Any late assessments will incur a 5% penalty per day.

Thesis B will be graded either satisfactory (EC) or unsatisfactory, and only students with a satisfactory grade will be permitted to proceed to Part C.

Thesis B (SOLA4952/9452) Assessment

A Seminar and progress report are the main assessments for thesis B, and your performance in thesis B to date.

Task	Due Date	Graded
Progress Update	Week 3 – Friday 5pm 2nd October	Loss of 2.5% from participation mark if not submitted (**No marks lost if handed in on time)**
Seminar Presentations Presentations will run in Microsoft Teams Choosing seminar times will open up 2 weeks before the seminar start date **Presentation due on Moodle**	Week 7 (26th – 30th October) Week 7 – 26th October by 8am	10% Loss of 5 marks out of 100 if not submitted on time
Progress Report*	Week 10 – 16th November Monday 5pm	5%

- See note above if planning to do thesis B and C together.

Progress Update – week 3

This will comprise a 1-2 page document (template on moodle) explaining the plans for thesis B for your project, a rough layout of the methodology for the project, and what you have accomplished so far.

Please submit your plan to moodle and email a copy to your supervisor by week 3 - Friday 2nd October by 5pm.

Note: a failure to do so will cause a deduction of 2.5% from the 10% of your participation mark

Seminar – week 7

Technical skills are 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 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 area. Students are assigned 20 minutes for their seminar presentation which includes approximately 5 minutes of question time. Students are also required to upload a copy of their presentation to moodle before the start of seminar week (in this case due Monday 26th October by 8am). Failure to do so will incur a penalty of 5% from your seminar mark.

Upload the presentation in the following format (Studentnumber_SURNAME_Presentationdate_time)

e.g. 1234567_KAY_THU_1100

In addition to giving a seminar, you are required to attend seminars given by at least four other students and to chair the speaker after you.

Your responsibility as chair:

- Introduce the next speaker
- Keep a track of the time – give the speaker a 2 minute warning before the 15 minutes is up
- Ask the audience for questions making sure they do not go longer than 5 minutes
- Thank the speaker

Seminar Attendance Sheets are to be submitted to moodle, attendance will be checked via teams participants.

The assessment will take account of the following:

Criteria	Mark	Marked out of	Guides
Structure - **logical development** - **clarity of description**		**10%**	**Unsatisfactory <5%** **Adequate (5%-6.5%)** **Good (6.5%-7.5%)** **Very Good (7.5%-8.5%)** **Outstanding (8.5%-10%)**
Subject Matter - **Contents of the problem and underlying theory** - **Knowledge of the area of investigation** - **Relation to published work** -		**15%**	**Unsatisfactory <7.5%** **Adequate (7.5%-9.5%)** **Good (9.5%-11.5%)** **Very Good (11.5%-12.5%)** **Outstanding (12.5%-15%)**

Technical Content - **Quality of thesis work** - **Methodology and work plan** - **Preliminary Results** You must show a detailed methodology. You will show how you have achieved the work against the project plan. Will cover a detailed discussion on work completed, showing an understanding of results to date and the implications of these results compared to what they found in the literature.		**40%**	**Unsatisfactory <20%** **Adequate (20%-26%)** **Good (26%-30%)** **Very Good (30%-34%)** **Outstanding (34%-40%)**
Presentation (i.e. English usage, rate of speech, audibility, use of aids, platform manner etc.)		**20%**	**Unsatisfactory <10%** **Adequate (10%-13%)** **Good (13%-15%)** **Very Good (15%-17%)** **Outstanding (17%-20%)**
Competence in handling questions		**10%**	**Unsatisfactory <5%** **Adequate (5%-6.5%)** **Good (6.5%-7.5%)** **Very Good (7.5%-8.5%)** **Outstanding (8.5%-10%)**
presentation uploaded on time		**5%**	

If failed attendance for the seminars a loss of 1% from the seminar mark.

Progress Report – week 10

The Progress Report will cover the following aspects: (more details will be posted onto the moodle page)

Descriptor	Weighting	
Mark bands		
Progress Report – including full table of contents (up to 2 pages not including table of contents)	60%	The table of contents should be as close as possible to the table of contents that will appear in your final thesis report. It should lay out the full structure of each section of your thesis. A table with the key details showing how you have achieved the work against the original project plan – showing your goals and tasks completed. Show key results and the implications of these results. A table template with examples will be posted on moodle
Reflection on Progress (up to 2 pages)	15%	Compares and contrasts the thesis, with industrial or other academic experiences. Evaluates changes in learning through the thesis and demonstrating self-awareness and develops plans that build on the research experience
Revised project plan (up to 2 pages)	15%	Discussions on future project plan and expected results. A reasonable strategy to ensure progress is stated.

Descriptor	Weighting	
Mark bands		
Document presentation	10%	The document follows a clear and logical structure indicated using headings and other conventions. The report is very easy to read: well- written, with good spelling and grammar, and appropriate language style. References in text match reference list (and vice versa) and are cited properly.

Presentation

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.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 5% per day 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.

Marking

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.

Examinations

There is no exam for this course.

Special consideration and supplementary assessment

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.

Please note that UNSW now has a Fit to Sit / Submit rule, which means that if you sit 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.

Thesis Withdrawal, Suspension, and Time Extension †

Requests for thesis withdrawal, suspension or extension should be made in writing to the Thesis Coordinator. The following procedures and rules will be applied when a student wishes to withdraw from, or suspend SOLA4952/9452. These rules supplement the UNSW deadlines, conditions, and procedures for withdrawing from a course.
PLEASE NOTE: **Thesis C must be completed in the term following Thesis B**

1. In every case where a student wishes to postpone completion of the thesis, i.e. to suspend work and complete the thesis in a later session, written approval of the supervisor must first be obtained before submitting a written request to the Thesis Co-ordinator.

   The supervisor may refuse approval for a variety of reasons, e.g. that the necessary facilities will no longer be available at the later date, that the supervisor will be absent, or that the student has already had overlong time on the particular thesis topic, etc.

   When a supervisor feels that a student is incapable of successfully completing the selected thesis topic, the supervisor should strongly advise the student to withdraw from that particular topic and seek a new one, possibly with a different supervisor.

2. A student who is permitted to withdraw without failure from subject SOLA4952/9452 should re-enrol in the following session with a Thesis Nomination Form. Note that under normal circumstances discontinuation without failure or financial penalty is possible only up to the Census Date.

3. When a student is granted an extension there may be a penalty resulting in a reduction of the thesis mark. This will be imposed according to rules approved by the Thesis Coordinator and will be done after consultation with the thesis supervisor. Supervisors and assessors marking the thesis should however award a mark entirely on the merits of the thesis, the reduction then being made subsequently by the Thesis Co-ordinator.

Expected resources for students

- Start work on your topic as soon as you can. This will give you plenty of time to address problems that you may encounter on the way.
- Plan the progress of your thesis using, for example, a GANNT chart, and revise the plan as it proceeds.
- Start by performing a review of the available literature on research completed in the same area as your project. This will help you further define your topic and the direction your thesis will take.
- Order materials as soon as you are sure what you need.

- *EndNote* is bibliographic software that allows you to manage your references in a database. References can be inserted from inside MS Word documents to create in-text citations and bibliographies in various referencing styles. The program is available free to UNSW staff and students. Information and links are available through the UNSW Library: http://info.library.unsw.edu.au/skills/endnote.html.

- The Learning Centre has an "Honours thesis writing for engineering and science students" guide at: http://www.lc.unsw.edu.au/thesis/index.html

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 come 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.

Also, projects involving animals will need ethics approval.

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

- If you have a question – ask!

UNSW Library website: https://www.library.unsw.edu.au/
Moodle: https://moodle.telt.unsw.edu.au/login/index.php

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.

Prizes

School Prizes

Two School prizes are associated with this course:

1. The Photovoltaics Thesis Prize for the best performance in an undergraduate thesis in the area of photovoltaics in the Bachelor of Engineering program. This prize is a cheque for $500.
2. Renewable Energy Thesis Prize For the best performance by an Undergraduate student in a Renewable Energy Thesis. This prize is a cheque for $500.

https://my.unsw.edu.au/student/prizes/PrizesEngineering.html#SchoolofPhotovoltaicandRenewableEnergyEngineering

Health and Safety

The University has a legal obligation to provide a healthy and safe workplace for employees and students. Students must follow reasonable directions of their supervisors and the Course Coordinator.

One way in which our safety is protected is through the preparation, review and approval of Risk Assessments. Students intending to carry out practical work are required to prepare or otherwise obtain a Risk Assessment for approval by their supervisor and by the Space Manager in whose space the work is to be done.

Risk Assessment templates for SPACES, EQUIPMENT and PROCEDURES are available on the moodle site. Risk Assessments and examples are already available, through your supervisor for many activities. Completed or modified versions should be submitted as signed hard copies and MS Word electronic versions to Kian Fong Chin (kf.chin@unsw.edu.au).

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. 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

Administrative matters and links

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

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	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