FACULTY OF ENGINEERING

**SCHOOL OF PHOTOVOLTAIC AND RENEWABLE ENERGY
ENGINEERING**

SOLA9451, SOLA9452 & SOLA9453

MEngSci POSTGRADUATE PROJECT

Thesis Part A (SOLA9451)
Thesis Part B (SOLA9452)
Thesis Part C (SOLA9453)

Term 1, 2019

Contents

Course Description and Eligibility

The Thesis Project is carried out in the last three terms of the PG course work 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. The thesis comprises a large portion of student's WAM calculations.

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.

Course Learning Outcomes (mapped to PGCW 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.

PG course work 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.

<u>Thesis Guidelines</u>

- The prerequisites for Thesis B (SOLA9452) and Thesis C (SOLA9453) are Thesis A (SOLA9451) and Thesis B (SOLA9452), respectively.
- With School 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 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.

Lectures and Information Seminar

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.

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.

Thesis Course Administration

Dr Ashraf Uddin is the PG Thesis Course Coordinator.

Technical issues should be resolved with the help of the nominated supervisor. However, if you experience any administrative issues, please see Dr Uddin.

> Dr Ashraf Uddin
> Room: 126, TETB
> Ph: 9385 9827
> Email: a.uddin@unsw.edu.au

Please do not leave problems and questions unresolved, as this could affect the successful completion of your thesis. Talk to your supervisor about any concerns or issues you may be experiencing, and if this becomes difficult, please see the Thesis Coordinator, the Undergraduate Coordinator, or even staff from the Counselling Service, www.counselling.unsw.edu.au, or the Learning Centre, www.lc.unsw.edu.au.

Website

The official subject site is Moodle and can be found by navigating to https://moodle.telt.unsw.edu.au/login/index.php . Here you will find information about the course, day-day announcements, and handouts, etc.

Thesis Topics and Thesis Nomination

A list of thesis topics will be posted on the thesis A Moodle site. Students should review the list and discuss the topics with the relevant supervisor to get an idea of what it entails. Once both the supervisor and student have agreed on the topic a Thesis Nomination Form should be completed and submitted to Ashraf Uddin and uploaded to the SOLA 9451 Moodle site prior to a student commencing work on their topic. Nomination form is available at the bottom of the course outlines and it is also available in the following webpage:
Nomination forms are available on the Moodle website:
https://moodle.telt.unsw.edu.au/course/view.php?id=39617
Students who wish to develop their own thesis topic are invited to do so, provided that they can find a supervisor from within the School. Students should discuss their potential topic with their proposed supervisor, and if the supervisor agrees, the student should attach a description of the thesis signed by the supervisor to the Thesis Nomination Form.
* Nomination forms should be submitted via the Moodle website and your name and details added to the thesis database*

The School also encourages students who wish to do an industry-led thesis topic. In this case the mentor from industry would be the student's co-supervisor, however an academic staff member from the School must act as the supervisor of the thesis. Students wishing to do an industry-led thesis must obtain approval from an academic of the School to supervise the topic and should submit a signed letter from the industry representative and academic supervisor with a brief outline of the project with their Thesis Nomination Form.

Assessment †

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 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. The literature review document will contain the following items: (Thesis A)

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 Report – this should comprise their methodology which includes their goals, tasks and outcomes and preliminary work. As part of the progress report a thesis table of contents should also be included outlining the structure of the thesis.
2. Seminar Presentation – The seminar should include aspects of the literature review/progress report and preliminary results.

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. Poster – Students will participate in a poster afternoon 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.

Deliverables:

	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 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. Progress Report	8	5%	Supervisor
	3. Seminar Presentation	9	10%	Supervisor/Assessor (50/50)
Thesis C	1. Final Report	10	60%	Supervisor/Assessor (50/50)
	2. Participation	10	10%	Supervisor
	3. Poster	11	5%	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 and having to give a short presentation to both assessor and supervisor (a 5 minute thesis presentation). They must be at a DN (75% marks) 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.

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

Thesis A (SOLA9451) Assessment

Thesis will run across 3 terms – Thesis A (SOLA9451), Thesis B (SOLA9452) and Thesis C (SOLA 9453), each having 4UOC with 12UOC in total. Thesis A will be taken first (in any term then thesis B and C the following semesters.

A literature review is the main assessment for thesis A, and your performance in thesis A to date.

Task – T1	Due Date	Graded
Find Supervisor – SOLA 9451 **have thesis nomination form signed by supervisor and register yourself on Moodle next to topic**	9am, 18th February Monday – if handed in late loss of 2% from supervisor participation mark	**No marks lost if handed in on time**
Project Plan	Week 3 – Friday 5pm 8th March	Loss of 2.5% from participation mark if not submitted (**No marks lost if handed in on time)**
Literature Review	Week 10 – Wednesday 5pm 24th April	10%

NOTE: A fail in thesis A will require students to re-enrol in thesis A again.

Below are things to consider when putting together the literature review document

Criterion	Tasks	Weighting	Pages
Literature Review	*(What is the problem to be solved, and its significance?)* • Brief background to project • Summary of literature relevant to project • Identification of "gaps" in the literature • Problem Statement (informed by gaps in the literature) • Hypothesis and aims	50%	12-15
Project Plan	*(How will the student answer the research question in the given time using their available resources?)* • Proposed Solution/Experimental Methodology • Thesis timeline – for next two terms o Justification of time allocation for each task • Available resources identified • Required training and upskilling identified	20%	3-5
Project Dependent Preparations	*(Can the student achieve the aims in the timeline? What progress has been made already?)* Project specific, but may include • Evidence of training on specific equipment • Evidence of some upskilling in new software/methods • Preliminary results • Preliminary sketches • Components/parts ordered • Detailed budget of parts to be ordered • Risk Assessment	20%	1-2
Document Presentation	• Report or slide structure and layout • English skills – spelling, grammar • Data presentation (if applicable) • Clarity of writing • Citations consistent and correctly formatted	10%	N/A

Plagiarism

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.*

Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's

assignment without appropriate acknowledgement

- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;

- piecing together sections of the work of others into a new whole;

- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,

- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;

- paraphrasing, summarising, essay writing, and time management;

- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students 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 items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

† Adapted with kind permission from the University of Melbourne.

To ensure that you are not penalised for plagiarism, ***please check that all material used in your report is referenced and attributed properly and that unreferenced text and figures are your own.***

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 SOLA9451. These rules supplement the UNSW deadlines, conditions, and procedures for withdrawing from a course.

PLEASE NOTE: **Thesis B must be completed in the term following Thesis A**

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 SOLA9451 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.

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 Blackboard 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).

Hints and Tips for the Thesis Course

➢ 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 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.

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!

PG Project Nomination Form

UNSW

School of Photovoltaic
and Renewable Energy
Engineering

Scan or hard copy to be submitted to the Postgraduate Coordinator a.uddin@unsw.edu.au by 5pm on Friday of week 1 of the semester of enrolment in SOLA9451.

SECTION 1 – STUDENT DETAILS

Student number:

Student Name: _____

Session to commence project: *(Circle one)*   T1, T2 and T2 ,   2019

Project Topic: _____

Project Units of Credit:
☐ 4UoC (SOLA9451) ☐   12 UoC over 3 terms (SOLA9451 followed by SOLA9452 and SOLA9453)

Student Signature: _____ **Date:** _____

SECTION 2 – SUPERVISOR'S APPROVAL

Supervisors: Please check the details provided by the student above. By signing in this section you are agreeing to supervise the student.

Supervisor's Name: _____ **Signature:** _____ **Email:** _____	**Phone No:** _____ **Date:**_____
Co-supervisor's Name: _____ **(if applicable)** **Signature:** _____ **Email:** _____	**Phone No:** _____ **Date:**_____

Comments: _____