UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 1 2019

MMAN4951

Research Thesis A

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1. Staff contact details

Academic staff, together with some senior engineers from industry, act as supervisors to students undertaking BE Thesis work. Support is also provided by the workshop and laboratory staff. For any project-related issues, contact your thesis supervisor directly.

Contact details and consultation times for course convenors

Name: Pietro Borghesani and Susann Beier
Office location: Ainsworth building (J17)
Tel: (02) 9385 7899 (Pietro)
(02) 9385 7580 (Susann)
Email: MMEresearchthesis@unsw.edu.au
Moodle: https://moodle.telt.unsw.edu.au/login/index.php

It is recommended you email the course conveners to make a specific appointment if you need to discuss any important organisational issues, particularly if you want to discuss extensions, supervisor issues, etc. Always consult the course Moodle first in case your questions have already been answered.

Contact details of the thesis administrator

Name: Ms Julisa Edwards
Office location: School Office, RM 112A, Level 1, Ainsworth building (J17)
Tel: (02) 9385 5782
Email: mech.teaching@unsw.edu.au

Contact Ms Edwards directly, with copy to the course conveners, if you have issues relating to your enrolment, progress, or other administrative queries.

Please also see the course Moodle Announcements and Q&A sections.

2. Important links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre

3. Course details

Credit points

This is a 4 unit-of-credit (UoC) course, and involves an unprescribed number of contact hours per week (h/w) with your supervisor. This varies on a case-by-case basis, as agreed with your supervisor.

Various factors, such as your own ability, your target grade, etc., will influence the time needed in your case.

This means that you should aim to spend not less than about 10 h/w on this course, including consultation with supervisor and workshop/laboratory staff and library/internet search. However, most students spend more time on their thesis work.

Contact hours

There are no set contact hours for thesis.

Summary and Aims of the 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.

Thesis A requires each student to demonstrate managerial, technical and professional skills in planning and executing an approved engineering project within a stipulated time limit. Each student is guided by their supervisor, but successfully planning, executing and reporting on the project are the sole responsibility of each student.

It is not the responsibility of the supervisor to tell the student what to do, nor should it be assumed that the supervisor is an expert in all areas of engineering. They are there to offer guidance and advice, as are laboratory staff, workshop staff, and others in the school that may have expertise in the area of your project. The successful execution of the project is solely the responsibility of the student.

Organisation and prerequisites. The undergraduate Research Thesis is organised in three courses: Thesis A (MMAN4951), B (MMAN4952) and C (MMAN4953). By default, students must ordinarily take Thesis A, Thesis B and Thesis C in each consecutive term. Thesis A is therefore the first course you have to undertake for the completion of the BE Research

Thesis and can be started in any of the three terms. Thesis A is a prerequisite for Thesis B, and Thesis B is a prerequisite for Thesis C. With School permission and only in exceptional circumstances, students may take Thesis A in the first term, then Thesis B and C together in the second term. This option is limited to students who can demonstrate the ability to progress and requires a prerequisite waiver to waive the Thesis B requirement for Thesis C.

Process for the initiation and update of the Thesis. **You must identify a supervisor and project prior to enrolling in this course.** This has to be formalised by the student using the "Research Thesis Proposal Form" available on the Mechanical Engineering Thesis Portal (Moodle). The proposal form must be compiled and signed by an academic supervisor from the School of Mechanical and Manufacturing Engineering. A scanned copy of the proposal must be submitted to Moodle by the due date (available on the portal). Without approval of your research proposal form from the course conveners, you will not be able to enroll or register for Research Thesis A.

It is your responsibility to keep your project details (supervisor, title, working abstract) up to date in the ***Your Project Details*** section of Moodle. This is CRITICAL. Please enter your family name first, followed by your first (given) name(s) as shown in your official UNSW student record and zID e.g. SMITH, John Reginald. This task is in addition to the BE Research Thesis approval form. ***This is a mandatory activity to be done by 5 pm, Friday Week 5.***

Laboratory Activities and Staff

You must seek guidance and approval from your Thesis supervisor prior to any laboratory activities.

The laboratories are the responsibility of the staff-in-charge, and you must operate within the accepted practices of the laboratory concerned. You should not expect laboratory staff to take responsibility for your thesis or carry out work for you. Laboratory staff are highly skilled and helpful; take full advantage of their experience.

If your project involves laboratory work, contact the officer-in-charge (OIC) of the laboratory in which you will be working as soon as possible to discuss your requirements. They will issue you with a Laboratory Access Approval (LAA) form which you must complete and return to the OIC.

Before you start work in a laboratory or undertake any activity which might be considered hazardous in any way, you must read and understand the practices and procedures described in the OHS section of the School's intranet:
https://eng-intranet.unsw.edu.au/mech-engineering/whs/SitePages/Home.aspx

Workshop

You must seek guidance and approval from your Thesis supervisor prior to requesting any workshop activities.

All student activities requiring manufacture in the Mechanical and Manufacturing Engineering (MME) workshop should be discussed with the workshop personnel at the inception of the work. The workshop personnel must have the opportunity to advise and influence the design to help minimise assembly, manufacture or functional problems.

The workshop is usually in very high demand. If you require the workshop to manufacture equipment essential to your thesis, then make sure that you discuss your requirements as early as possible with the Workshop/Laboratory Manager. You should provide engineering drawings which are first approved by the laboratory OIC. You should make every effort to minimise the Workshop load by modifying existing equipment rather than building from new, and by keeping your designs simple.

Safety Training

A full list of safety training requirements for BE Thesis students is available on the School's intranet. Safety in any project is paramount and it is mandatory to complete risk paperwork for all activities. Always discuss with your supervisor what your plans are and what risk assessments will be required.

Student learning outcomes

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:

Learning Outcome		**EA Stage 1 Competencies**
1.	Develop a design or a process or investigate a hypothesis following industry and professional engineering standards.	PE2.1, PE2.2, PE2.3, PE2.4
2.	Critically reflect on a specialist body of knowledge related to their thesis topic.	PE1.3
3.	Apply scientific and engineering methods to solve an engineering problem.	PE2.1
4.	Analyse data objectively using quantitative and mathematical methods.	PE1.2, PE2.1, P2.2
5.	Demonstrate oral and written communication in professional and lay domains.	PE3.2

4. Teaching strategies

There is no formal teaching, but students learn from both internal and external sources. The supervisor, other academics and laboratory/workshop staff are the internal sources, whereas the Library, internet and industry mentors are the external sources.

5. Course schedule

There are no set lectures for this course, but a number of workshops may be provided to assist students to complete their thesis to a high standard. The date and time of any workshops will be announced on Moodle.

6. Assessment

The following details might undergo some changes depending on Faculty guidelines. Any change will be clearly communicated on the Moodle page.

Thesis A and B will initially carry a ‘satisfactory’ (EC grade) or ‘not satisfactory’ (EF grade). Only students receiving a ‘satisfactory’ evaluation in Thesis A will be allowed to enroll in Thesis B. After the completion of Thesis C, a student’s final Thesis mark will reflect the overall weighted percentage of marks achieved during all three courses (A, B and C), and the earlier EC grades will be replaced with the final mark at that time.

There is one assessment item in Thesis A: the “Interim Report and Project Plan”. The “Interim Report and Project Plan” is a written document which must include:

a) A literature review or equivalent
b) Problem statement, hypothesis and aims
c) Project planning: proposed method & possible solutions, thesis timeline
d) Risk assessment
e) Thesis outline

For more details on the required components, please read the marking criteria provided further in this document.

Note that the participation in Thesis A, B and C (i.e. engagement, attendance and commitment) will also contribute to your final evaluation, and you will receive a mark for this in Thesis C.

Assessment overview

Assessment	Group Project?	Length	Weight (% of entire Thesis A+B+C grade)	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Interim Report and Project Plan	No	20 pages max (excl. appendices)	15%	1, 2, 3 and 5	Rubric below	Friday 5pm Week 10 In addition, students must **register their Project Details by 5pm Friday Week 5** (see details below) [1]	No late submissions allowed	Two weeks after submission

[1]IMPORTANT: You are required to provide the final details (title, supervisor, abstract) of your project on Moodle before Friday 5pm, Week 5. Failure to do so will incur in late penalties for your report, as your report will not be allocated for marking.

Marking scheme for Interim Report and Project Plan

Your Interim Report and Project Plan should include:

- a literature review of the relevant research field(s), allowing to formulate
- a research question / problem statement consistent with the identified research gap, supported by explicit hypotheses and complemented by clear research thesis aims;
- a research plan with activities (methods) and timeline;
- provisions for major risks and contingencies; and
- a draft outline (table of contents) of the Thesis, with detailed sub-section headings linked to the research question and planned activities (this must be attached as an appendix and is considered outside the page limit).

Submission

Please submit your Interim Report and Project Plan electronically, directly through the portal which will be made available on Thesis A Moodle.

The supervisor will assess the report and grade the work; in order to progress to MMAN4952 Research Thesis B, the grade must be greater than 50% total. The supervisor will provide feedback on the student's progress and may ask for additional material (i.e. expanded literature review). It is up to you to discuss with your supervisor the exact content of the report, but ideally it should be based on the template that will be made available on Moodle.

No late submission is allowed without an approved extension.

Normal cases for special consideration (illness, misadventure) should be lodged through the formal UNSW system and dealt with accordingly. 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.

Other applications for extension of submission of thesis reports (e.g. equipment breakdown, etc.) must comply with the following:

1. The request for extension must come from the supervisor. That is, it is written by, and justified, by the supervisor.
2. Request must be lodged by week 7 of term.

Work submitted after the due date without a previously approved extension is therefore not accepted and a mark of zero will be awarded (Fail).

Marking criteria and rubrics for Interim Report and Project Plan

Marking criteria for the Interim Report and Project Plan are as follows:

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	50%	12-15
Research Question and Project Plan	(*How will the student answer the research question in the given time using their available resources?)* • Research question • Hypothesis and aims • Proposed Solution/Experimental Methodology • Thesis timeline – for next two terms ○ 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

Marking guidelines are provided below to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided in the next few pages.

Criterion 1: Literature Review (50%)

Grade	Mark	Brief description	Longer explanation / examples
Fail	0-49	Deficient	Deficient work may be characterised by a number of features, including inappropriate reliance on sources not peer reviewed (such as the internet), not reviewing what should be the core of the literature in a particular area, or not reviewing any recent work (within, for example, the last 5 years although this will depend somewhat on the field).
Pass	50-64	Adequate	The literature reviewed is sufficient to inform the proposed research, although it is likely that further review will be required as the work progresses. What distinguishes work at this level from work at the next level up is quantity: an adequate review of the literature sketches enough that the reader can see what the picture is about, but neglects significant aspects. i.e., are there significant holes in this review?
Credit	65-74	Solid	The most significant areas of literature relevant to the proposed work have been reviewed. There are no major "holes". What is generally missing in this band, but present in higher quality work, is the student showing that they understand the conceptual relationships between the different reviewed works.
Distinction	75-84	Solid, and linked	The most significant areas of literature relevant to the proposed work have been reviewed and the student has clearly identified one or more knowledge gaps. The student will have shown that they understand the conceptual relationships between reviewed works and between reviewed works and the student's research project, i.e., the student makes intellectual connections between the different parts of the review and puts their work in context.
High distinction	85-100	Of review paper quality	In addition to meeting the quality at the previous band – "Solid, and linked" – the student has made a critical assessment of the literature in the context of their research project to a depth and breadth that is of the quality that could be anticipated to be seen in a journal review paper.

Criterion 2: Research Question and Project Plan (20%)

Grade	Mark	Brief description	Longer explanation / examples
Fail	0-49	Broad context missing.	The research question is not explained and there is no clear demonstration of student understanding. The research plan is not present, or does not have sufficient detail to demonstrate that the student can successfully complete a thesis project. No thesis outline is presented (i.e., thesis chapter headings).
Pass	50-64	Broad context present. No specific plan.	Research question and plan are presented, but lack detail and a logical plan of investigation. There is enough of a plan to believe that the research project is feasible. Generic chapter headings may show no particular relevance to the research.
Credit	65-74	Broad context present. Specific logical plan.	Research question and plan are presented, and include some detail. There is enough of a plan to believe that the research project is feasible, and that the student understands the resources and time required. The plan does not appear to be informed by the literature review – it sits largely separately to the literature review, it is not part of the narrative developed in the review. Thesis outline reflects the research plan, but lacks sufficient detail.
Distinction	75-84	Broad context present. Specific logical plan. Plan fits the review narrative.	The plan fits within the narrative set out by the literature review – the student makes clear why the plan is developed this way in the narrow context of the reviewed literature. The research plan demonstrates a logical and feasible course of action. Realistic milestones have been set. The thesis outline demonstrates a logical vision for the thesis.
High Distinction	85-100	Broad context present. Specific **and robust** logical plan. Plan fits the review narrative.	The plan is robust and has provision for project variations and contingencies. The plan fits within the narrative set out by the literature review – the student makes clear why the plan is developed this way in the context of the reviewed literature. The thesis outline includes sub-sections, logical flow with a clear connection to the project plan and literature review.

Criterion 3: Project Dependent Preparations (20%)

Grade	Mark	Brief description	Longer explanation / examples
Fail	0-49	Insufficient preparations	The report does not provide evidence of the student having undertaken: • Sufficient training and upskilling in the subject, techniques, software and/or equipment use which is required by the Project • Sufficient preparations for the practical execution of the Project (these are project specific, but might in general include ordering of parts, budgeting, approval documents, etc.) • Sufficient assessment and countermeasures for key risks of the Project
Pass	50-64	Limited preparations	All the required preparations (Project specific, see list above for examples) are present but require significant revision in order to proceed with the Project. No significant preliminary results
Credit	65-74	Solid preparations	All the required preparations (Project specific, see list above for examples) are present and do NOT require significant revision (ready to proceed). Very limited or no significant preliminary results.
Distinction	75-84	Solid preparations and preliminary results/outputs	All the required preparations (Project specific, see list above for examples) are present and do NOT require significant revision (ready to proceed). Significant preliminary results are provided, which allow confirming or adjusting the Project plan.
High distinction	85-100	Solid preparations and exceptional early results/ outputs	All the required preparations (Project specific, see list above for examples) are present and do NOT require significant revision (ready to proceed). Exceptional progress already reported in the document, which allows confirming or adjusting the Project plan and already drafting some preliminary answers to the Project's research questions.

Criterion 4: Document Presentation (10%)

Grade	Mark	Brief description	Longer explanation / examples
Fail	0-49	Impedes document reading	Presentation is poor to the extent that it impedes reading of the document. Examples include multiple inconsistent citation styles or incomplete citations, unintelligible grammar, figures or tables not labelled or badly inconsistent document formatting.
Pass	50-64	Poor formatting / document structure	Document is not at a professional level. Although figures and diagrams are labelled and references in text match reference list (and vice versa), formatting is unclear and inconsistent to the extent that the reader can lose track of the context when reading.
Credit	65-74	Poor judgement with respect to layout, possible padding	Appropriate use of section and sub-section heading structures, . Figures and diagrams are labelled, formatting is consistent, references in text match reference list (and vice versa), pictures are clear and attributed, sections clearly labelled. There may be superfluous material present, such as unnecessary, repetitive or unusually large figures, unnecessarily lengthy text, unusually wide margins, unnecessary appendices, etc.
Distinction	75-84	Professional, may have issues with data presentation	Everything from above, plus a logical flow of sections, and appropriate judgement in the placement data, tables or figures in the body of the work or the appendices. Figures and diagrams are correctly and clearly labelled, text spacing aids readability, consistent formatting, references in text match reference list (and vice versa), pictures are clear and attributed, sections clearly labelled. Some of the graphical presentation of data is inappropriate - poor choice of axes, overcrowding, poor use of chart space etc.
High Distinction	85-100	Professional, concise and readable	Everything from above, plus text is clear and concise. Graphical presentation of data is appropriate, clear and economical.

Consequences if you fail in Research Thesis A

If you Fail in MMAN4951 Research Thesis A, you must enrol in MMAN4010 Thesis A (Practice) in a future semester. If you believe your case has extenuating circumstances and you would like to re-enrol in MMAN4951, you will need to schedule an appointment to discuss your case with the course convenor(s) and your supervisor.

7. Expected resources for students

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

8. 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.

In this course, recent improvements resulting from student feedback include longer presentation times, listing of resources and multiple information sessions.

9. 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

10. Administrative matters and links

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

- Attendance
- UNSW Email Address
- Computing Facilities
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Lab Access
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

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