Mechanical and Manufacturing Engineering

Course Outline

Term 2 2020

MMAN4951

Research Thesis A

Contents

1. Staff contact details 2
Contact details and consultation times for course convenor 2
2. Important links 2
3. Course details 2
Credit points 2
Contact hours 3
Summary and Aims of the course 3
Aims 3
Organisation and prerequisites 3
B+C in one Term 3
Laboratory Activities and Staff 4
Workshop 4
Student learning outcomes 5
4. Teaching strategies 6
5. Course schedule 6
6. Assessment 6
Assessment overview 7
Marking criteria and rubrics for Interim Report and Project Plan 8
Submission 13
Confidential Submission 13
Late submission of the report 13
Extensions and special consideration 13
Feedback and Template use 14
7. Consequences if you fail in Research Thesis A 14
8. Expected resources for students 14
9. Course evaluation and development 14
10. Academic honesty and plagiarism 14
11. Administrative matters and links 15
Appendix A: Engineers Australia (EA) Competencies 16

1. Staff contact details

Academic staff, sometimes together with some senior engineers from industry, act as supervisors to students undertaking 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 convenor

Name: Professor Tracie Barber
Office location: Ainsworth building (J17)
Tel: (02) 9385 4081
Email: t.barber@unsw.edu.au (email is the easiest way to contact me)

Please consult the course Teams site first in case your questions have already been answered by information available online.

2. Important links

- Lab Access
- Health and Safety
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering
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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.

This course requires each student to demonstrate managerial, technical and professional skills in planning and executing an approved engineering project within a stipulated time limit. The student should show improved project management skills in the progression from Thesis A to B and C, as well as a deeper understanding of the specific research topic. 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 consecutive terms. Thesis A is therefore the first course you have to undertake for the completion of the 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. If you need to complete your Thesis in two terms only and your program allows it, then you should choose the Practice thesis stream (MMAN4010-MMAN4020).

B+C in one Term

With School permission and only in exceptional circumstances, students may apply to take Research Thesis A in one term, then Research Thesis B and C together in the subsequent term. This option is limited to students who have exceptional circumstances, have a compelling reason not to choose the Practice thesis stream and can demonstrate an

outstanding ability to progress. Moreover, it requires a prerequisite waiver to waive the Thesis B requirement for Thesis C.

Laboratory Activities and Staff

COVID-19 NOTE: The School laboratory facilities are open to research thesis students in T2; however, access is limited. To comply with government's social distancing requirements, e.g., 4 square meters per person, each room has a maximum capacity limit, which will be monitored by the supervising professional staff. Please check with the laboratory officer in your area before accessing and observe the limit and all other safety precautions.

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. Laboratory staff are highly skilled and helpful; take full advantage of their experience; however, you should not expect laboratory staff to take responsibility for your thesis or carry out work for you.

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.

For more information about accessing the School's laboratories, please visit the School website: https://www.engineering.unsw.edu.au/mechanical-engineering/resources/lab-access-how-to-forms

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.

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.

6. Assessment

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

Thesis A and B will initially carry a ‘satisfactory’ (EC grade) or ‘not satisfactory’ mark. Only students receiving a ‘satisfactory’ evaluation in Thesis A will be allowed to enroll in Thesis B, and only students receiving a ‘satisfactory’ evaluation in Thesis B will be allowed to enroll in Thesis C. After the successful 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”, whose details are reported below. In order to progress to Research Thesis B, the grade of your report must be greater than 50%.

Please also consult the report’s template (available on Teams).

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	25 pages max (excl. appendices and references)	15%	1, 2, 3 and 5	Rubric below	Friday 5 PM Week 10 In addition, students must **register their Project Details by 5pm Friday Week 5** (see details below)	5 PM Friday week 11	Two weeks after submission

IMPORTANT: You are required to provide the final details (e.g. title, supervisor) of your project before Friday 5* PM*, Week 5. Failure to do so will incur in late penalties for your report, as your report will not be allocated for marking.

Marking criteria and rubrics for Interim Report and Project Plan

Note: The points in the marking criteria will be scaled by the associated weighting in the Marking Criteria Summary.

Marking Criteria Summary

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

Criterion 1: Literature Review

Grade	Mark	Brief description	Longer explanation / examples
Fail	0-49%	Deficient	Deficient work may be characterized 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 (and includes recent work) 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 (including recent work). 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 (including recent work) 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, 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

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	In addition to the above: 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	In addition to the above: 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

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, this apply to all grade descriptions) 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 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 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 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

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.

Submission

Please submit your report electronically, directly through the submission inbox which will be made available, unless you have been granted “confidential submission”.

Your Project Details (e.g. title, supervisors) are still to be available to UNSW personnel for organisational and assessment allocation purposes.

Confidential Submission

Confidential submission of reports can be granted by the course conveners in case of confidential projects (i.e. with sensitive data from company partners). This must be requested from the course conveners at the beginning of Thesis A (not later than Week 4 of Thesis A) by the student and have the support of the supervisor (email explaining reason). If you have been granted “confidential submission”, you should SUBMIT DIRECTLY TO YOUR SUPERVISOR by means of a medium agreed with your supervisor, still within the same assignment deadline.

Please note that Thesis C will require two markers, so you and your supervisor will need to propose a solution that satisfies your confidentiality constraints. The convenors will have to approve your proposed solution before the beginning of Thesis C.

It is always the student’s responsibility (in discussion with the primary supervisor) to ensure that the confidentiality constraints are met in the processes of submission, marking and thesis document management.

Late submission of the report

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day (weekends and public holidays count as days) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. The penalty applies until the marks for the course decrease to 50, and further lateness does not result in failure of the course, until the deadline for absolute fail. Any report submitted after the ‘deadline for absolute fail’ is not accepted and a mark of zero will be awarded for that assessment item, thus resulting in the failure of the course. The penalty will be applied directly by the marker.

Extensions and special consideration

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

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

consideration, 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.

Feedback and Template use

The supervisor (or a delegated marker in case of supervisor unavailability) will assess the assignments and grade the work. The supervisor will provide feedback on the student's progress and may ask for additional material. It is up to you to discuss with your supervisor the exact layout of the report, but it should be based on the template that will be made available.

7. 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 term. 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.

8. Expected resources for students

UNSW Library website: https://www.library.unsw.edu.au/
UNSW Course Teams site

9. Course evaluation and development

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. In our efforts to provide a rich and meaningful learning experience, we have continued to evaluate and modify our delivery and assessment methods.

10. 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

11. 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
- 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