



**MASTERS (ADVANCED) PROJECT
and
MARINE ENGINEERING RESEARCH PROJECT
HANDBOOK**

**SCHOOL OF MECHANICAL ENGINEERING
2009**

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1 Introduction

Purpose of This Document

This handbook contains information about the MECHENG 7041 - Masters (Advanced) Project and MECHENG 7049 - Marine Engineering Research Project. It is intended to serve as a first point of reference for any queries.

Who This Document is For

This document was written for students taking the MECHENG 7041 Masters (Advanced) Project or MECHENG 7049 - Marine Engineering Research Project course.

2 Course Description

Course Code: MECHENG 7041 & 7049

Course Type: Core for Masters (Advanced) programs and elective for Masters in Marine Engineering

Credit: 12 Units (2 semesters)

Offered in Semester: Commence in Semester 1 or semester 2 but preferably Semester 1

Pre-requisites / Assumed Knowledge: 18 units of courses from the Masters program must have been completed prior to beginning this course

Teaching Method: There are no formal lectures. However, each student must meet weekly with their supervisors. Students shall work **individually** on a two-semester research and development project under the supervision of an academic staff member and in some cases an external person from a company which may be sponsoring the project. In some cases several individuals may be working on the same project using the same experimental equipment. In these cases each student will be responsible for a particular aspect of the project and will be required to submit an individual report and present an individual seminar.

Assessment: The assessment for the project will include the extent to which the student achieves the objectives defined in the project definition statement. In particular the student will be assessed against their attitude (or performance), which includes meeting attendance, keeping a workbook and keeping a timesheet, and the deliverables listed below. Details of what is expected for each deliverable and its relative weighting in the overall assessment scheme are provided in this project manual,

Project Definition statement

Project Plan

Mid-project report

Final Report

Research Paper

Final Seminar

Course Objectives: The Masters project aims to educate students in research and development methodology and techniques, develop critical evaluation skills appropriate to their project topic, and provide project management experience.

On completion of the course, students should:

- Have a good understanding of the research methodology that should be employed when undertaking a technical research project.
- Be able to apply project management and critical thinking principles to obtain the required project outcomes
- Be able to critically review current literature relevant to a proposed research project.
- Be able to define and scope a research project from vague descriptions of problems that the research needs to address.
- Be able to design numerical or physical experiments to verify any theory or hypotheses developed as part of the project.
- Be able to apply the appropriate software tools or instrumentation necessary to obtain sensible results from the physical or numerical experimental work.

- Be able to undertake an error analysis on the experimental or numerical results and identify the major contributing factors to any errors.
- Be able to write up and summarise the results of a research project in the form of a technical paper.
- Be able to produce a properly laid out and formatted technical report detailing the research project and all aspects of the work undertaken to achieve the results.
- Be able to communicate the results of the project verbally in the form of a seminar to colleagues.
- Understand the need to undertake lifelong learning.

Graduate Attributes to be developed:

- ability to apply knowledge of basic science and engineering fundamentals;
- ability to undertake problem identification, formulation and solution;
- understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development;
- understanding of professional and ethical responsibilities and a commitment to them;
- expectation of the need to undertake lifelong learning, and the capacity to do so.

Assessment of Graduate Attributes: All attributes except the last will be assessed through assignments and examination. The last attribute is expected to be developed as a result of the formal program of study and the realisation by students that to be a competent and effective member of the engineering profession, it is necessary to continually update knowledge and skills through various professional activities such as attendance at conferences and short courses as well as reading and contributing to professional journals.

Course Synopsis: The topic of the research and development project will be agreed upon by discussion between the project supervisors and the student

Content: The course consists of project work, a structured program and a research seminar program.

The project work consists of research and development aimed at providing solutions to engineering problems related to industry or to school research, with emphasis on project management and effective communication.

The School structured program consists of the School Induction, the Barr Smith Library tutorial and the Masters Project tutorial.

The School Induction includes the following topics:

- layout of school and introduction to key staff
- building access and security
- access to computing facilities and policies on their use
- access to telephones and policies on their use
- Occupational Health and Safety issues, including evacuation procedures, location of first aid assistance, laboratory and workshop rules.

The Barr Smith Library tutorial is to be done in conjunction with library staff and includes an introduction to online search and database facilities.

The School research seminar program consists of attendance at weekly research seminars presented during the semester teaching weeks in the School of Mechanical Engineering.

Text book: None

Recommended Reading: A comprehensive list of references will be advised by supervisor.

Workload: Each student is expected to work approximately 300-350 hours each semester for two semesters.

Course Schedule: The activity schedule for the two project semesters is shown below.

Project schedule for the two project semesters

Date	Activity	Deliverable
First Project Semester		
Orientation Week	Students select projects from web server https://www.mecheng.adelaide.edu.au/mastersprojects/ or they may have their own proposal from their work place.	Project title and 5 line summary
Week 1, Monday	Students make an appointment to discuss their project with the supervisor named on the project data base	
Week 1	Meet supervisor and begin project work	
Week 1 – Week 3	Attend School Induction Attend Barr Smith Library Tutorial	
Week 1 – Week 12	Attend Masters Project Tutorial Attend all M.E. regular research seminars	
Week 2	Submit Project Definition statement to project supervisor	1-2 pages
Week 6, Friday, 4pm	Submit Project Plan [§]	Plan
Week 7	Project Definition statement and plan assessment by supervisor	
Week 12, Friday, 4pm	Submit Mid-Project Report [§] Submit project workbook [§]	Report and Workbook
Week 13	Review progress with supervisor End first part of project	
Week 14, Friday, 4pm	Project performance, mid-project report and workbook assessment by supervisor and moderator	
Second Project Semester		
Week 1	Begin second part of project	
Week 1 – Week 12	Attend all M.E. regular research seminars	
Week 12, Friday, 4pm	Submit Final Report [§]	Report
Week 12, Friday, 4pm	Submit Research Paper [§]	Research Paper
Week 12 – Week 13	Present seminar	Seminar
Week 12, Friday, 4pm	Submit project workbook Submit documentation CD	Workbook Documentation CD
Week 14	Meet supervisor for a feedback session	
Week 14, Friday, 4pm	Project assessment by supervisor and moderator	

[§] These reports shall be submitted via the School Office to the Masters by Coursework Co-ordinator. **A late penalty of 10% of the maximum report marks is applied** for each day beyond the nominal submission date. Supervisors will vary this rule only in the most unusual circumstances, and then only with the approval of the Head of School.

Important Dates: The calendar dates of the activities in the activity schedule can be found on the University website: www.adelaide.edu.au/student/info/dates.

IMPORTANT: STUDENTS DOING AN INDUSTRY PROJECT MUST MEET WITH THEIR INDUSTRY SUPERVISOR FOR AT LEAST ONE HOUR PER WEEK AND THEIR UNIVERSITY SUPERVISOR FOR AT LEAST

ONE HOUR EVERY 2 WEEKS THROUGHOUT THE DURATION OF THE PROJECT. STUDENTS UNDERTAKING A UNIVERSITY BASED PROJECT MUST MEET WITH THEIR UNIVERSITY SUPERVISOR FOR AT LEAST ONE HOUR PER WEEK THROUGHOUT THE DURATION OF THE PROJECT. THESE MEETINGS ARE IN ADDITION TO THE MEETINGS SCHEDULED IN THE COURSE SCHEDULE ON THE PREVIOUS PAGE.

FOR INDUSTRY BASED PROJECTS, THE PROJECT ASSESSMENT MODERATOR MAY BE THE INDUSTRY SUPERVISOR. FOR ALL NON-INDUSTRY BASED PROJECTS, THE MODERATOR WILL BE A MEMBER OF ACADEMIC STAFF WITH APPROPRIATE EXPERTISE.

DEADLINES

IT IS IMPORTANT THAT ALL STUDENTS MEET DEADLINES. THERE IS A PENALTY OF 10% PER DAY FOR ANY ASSESSMENT ITEM THAT IS HANDED UP LATE. PLEASE HAND UP ALL ASSESSMENT ITEMS TO THE SCHOOL OFFICE WHERE YOU WILL NEED TO FILL OUT, SIGN AND DATE A COVER SHEET TO BE ATTACHED TO YOUR ASSESSMENT ITEM. ASSESSMENT DEADLINES ARE NON NEGOTIABLE AND ONLY WILL BE GIVEN ON SERIOUS MEDICAL GROUNDS FOR A CONDITION EXISTING FOR A CONTINUOUS WEEK BEFORE THE DEADLINE. THE MESSAGE IS THAT YOU SHOULD PLAN TO COMPLETE YOUR WORK WELL BEFORE ANY DEADLINE IN CASE YOU GET SICK IN THE FEW DAYS LEADING UP TO THE DEADLINE.

Graduate Attributes: The course facilitates an environment in which graduates are encouraged to take personal responsibility for developing the following attributes.

- GA1** An advanced level of knowledge and understanding of the theory and practice of engineering and the fundamentals of science and mathematics that underpin these disciplines.
- GA2** A commitment to maintain an advanced level of knowledge throughout a lifetime of engineering practice and the skills to do so.
- GA3** The ability to apply knowledge in a systematic and creative fashion to the solution of practical problems.
- GA4** A commitment to the ethical practice of engineering and the ability to practice in a responsible manner that is sensitive to social, cultural, global, legal, professional and environmental issues.
- GA5** Interpersonal and communication skills for effective interaction with colleagues and the wider community.
- GA6** An ability to work effectively both independently and cooperatively as a leader, manager or team member with multi-disciplinary or multi-cultural teams.
- GA7** An ability to identify, formalise, model and analyse problems.
- GA8** The capacity to design, optimise, implement, test and evaluate solutions.
- GA9** An ability to plan, manage and implement solutions that balance considerations of economy, quality, timeliness and reliability as well as social, legal and environmental issues.
- GA10** Personal attributes including: perseverance in the face of difficulties; initiative in identifying problems or opportunities; resourcefulness in seeking solutions; and a capacity for critical thought.
- GA11** Skills in the use of advanced technology, including an ability to use complex instrumentation
- GA13** An ability to utilise a systems approach to design and operational performance.
- GA14** Understanding of the principles of sustainable design and development.

3 Project Assessment

Students shall be assessed on the performance of research, planning, execution and management of the project, as well as on the quality of the project deliverables. The assessment is conducted in stages over the two project semesters.

The project assessment consists of three modules. Some of these modules have sub-modules. The modules are broken down as follows:

- Project Performance Assessment
- Reports Assessment, consisting of
 - Project definition statement
 - Project Plan
 - Preliminary project report
 - Final Report
 - Research Paper
- Final Seminar Assessment

The assessors are the project supervisor and the moderator. The assessment role of the supervisor is to provide primary marks on all the three assessment modules. The role of the moderator is to provide secondary assessment to moderate the marks of the supervisor for some of the assessment tasks. The contributions of the assessment components and the assessors are weighted as shown in Table 3.1 below.

Assessment components and weighting

	Project part for which result is recorded	Supervisor	Moderator	Sub-Total
Student Performance				
First Semester	Part 1	10%	-	
Second Semester	Part 2	5%	-	
Sub-Total		15%	0%	15%
Reports				
Project Definition statement	Part 1	5%	-	
Project Plan	Part 1	5%	5%	
Mid-project report	Part 1	15%	10%	
Final Report	Part 2	15%	10%	
Research Paper	Part 2	5%	5%	
Sub-Total		45%	30%	75%
Seminar				
Final Seminar (assessed by the academics present at the seminar)	Part 2	10%		
TOTAL		65%	35%	100%

3.1 Student Performance Assessment

The requirements to pass this part of the project assessment, and their associated activities and assessment measures, are listed below.

Table 3.2: Student performance requirements and assessment weighting.

Requirement	Assessment Weight	Activity	Measure
1. The project shall begin properly.	20% (for first project semester only)	Begin the project promptly.	Observed initial meeting attendance.
		Understand the problem that is to be solved.	Contribution to initial discussions with supervisor. Workbook entries.
		Set realistic objectives.	Work definition statement submission.
2. Students shall put in a consistent effort throughout the project.	40%	Work consistently and according to agreed timeline.	Consistency and quality of workbook entries. Observed progress made on the project.
		Plan, attend and contribute to discussion at regular meetings.	Observed behaviour in meetings. Quality of minutes of meetings.
		Show enthusiasm for and commitment to the project.	Observed behaviour in meetings and/or the laboratory Degree of interaction with technical staff, colleagues and supervisor outside of mandatory meetings. Evidence of extra reading, insight, etc. in workbook.
3. Students shall adopt good engineering practices.	40%	Observe ethical practice.	Observed behaviour in the laboratory and at meetings.
		Undertake project work with appropriate methods, techniques, tools, etc.	Observed behaviour in the laboratory.
		Manage changes when necessary.	Progress reports, meetings, updating of plans including Gantt charts, recording of decisions.
		Manage resources effectively.	Meetings, progress reports, observed behaviour in laboratory.
		Accurately record project activities in a workbook	Quality of workbook documentation

		Keep a record of time spent on project activities.	Timesheet entries, workbook entries.
4. The project shall end properly.	20% (for second project semester only)	Conduct a project close-out session upon the completion of the project.	Submit required files & directories, documents, hardware and workbook. Return loan items. Conduct a 'lessons learned' session.

Additional guidelines for the performance assessment can be found in Appendix B.

The project workbook shall be submitted as part of the project performance assessment. The workbook is a record of the work that you did for the project. Guidelines for the workbook are given in Appendix C.

3.2 Project Definition Statement Assessment

The Project Definition Statement is a statement that defines the aims of the project, the expected outcomes and the deliverables. More information can be found in Appendix D. The project definition statement allows your supervisor to ensure that you understand what is required of the project at a very early stage. It is assessed according to the guidelines in Table 3.3.

Project Definition Statement requirements and assessment weighting

Requirement	Assessment Weight	Details	Measure
1. The document shall establish a common understanding between you and your supervisor of the project requirements.	40%	Project requirements and specifications; project products.	Appropriateness of proposed requirements, specifications and products.
2. The document shall contain a description of expected project outcomes and deliverables.	40%	Project outcomes and deliverables.	Appropriateness and achievability of outcomes and deliverables
3. The document shall be well presented	20%	Structure and organisation; layout and format; expression, grammar and spelling, and appropriate length.	Quality of writing. Extent to which the document meets the requirement details.

3.3 Project Plan Assessment

The project plan should be a detailed plan describing how you will go about achieving the outcomes stated in your project definition statement. It should also give a list of milestones with corresponding dates and clearly separate the required tasks into individual roles and include the project definition statement. The project plan is assessed according to the guidelines in Table 3.4.

Project Plan requirements and assessment weighting.

Requirement	Assessment Weight	Details	Measure
1. The document is an extension of the project definition statement and should begin by establishing a common understanding between you and your supervisor of the project requirements.	10%	Project requirements and specifications as updated from the project definition statement.	Appropriateness of proposed requirements and specifications
2. The document shall contain a project plan in accordance with engineering project management practices.	50%	Investigation methods; resources required; execution plan; timeline; analysis and management of risks.	Appropriateness of investigation methods, resources required, execution plan, timeline, and risk management.
3. The document shall contain a description of expected project outcomes and deliverables.	10%	Project outcomes and deliverables – as updated from the project definition statement.	Appropriateness and achievability of outcomes and deliverables
4. The document shall be well presented (see guidelines in Appendix D).	20%	Structure and organisation; layout and format; expression, grammar and spelling, and appropriate length.	Quality of writing. Extent to which the document meets the requirement details.
5. The document format shall conform to the School's project document standards.	10%	<p>A maximum length of 50 pages of text, diagrams, tables and figures, not including the title page, executive summary, table of contents, references and any appendices.</p> <p>The format of 12 point font, 2.5cm left margin, 2.5cm margins on top, bottom and right side, single line spacing, printed only on one side.</p> <p>Inclusion of signed Assessment Cover Sheet.</p> <p>Inclusion of an Occupational Health and Safety risk assessment of the work that will be carried out during the project.</p> <p>The document in spiral binding when submitted.</p>	Extent to which the document meets the School's project document standards.

Additional guidelines and a suggested Project Plan layout are available in Appendix D.

3.4 Preliminary Project Report Assessment

The Preliminary Report is to meet the following objectives:

1. To provide a critical literature review
2. To update the descriptions of how the project will be managed and the expected outcomes.
3. To provide any preliminary findings.

3.4.1 Requirements for the Document

The Preliminary Report requirements, assessment weights and activity details are listed in Table 3.5. The preliminary report should include some material from the project plan as well.

Additional guidelines and a suggested Preliminary Report layout are available in Appendix E.

Preliminary Report requirements and assessment weighting.

Requirement	Assessment Weight	Details	Measure
1. The document shall contain a detailed and critical literature review of past work relevant to the project	35%	Review of all relevant literature	Extent of literature covered, appropriateness of literature reviewed and quality of the critical review.
2. The document shall contain an updated project plan in accordance with engineering project management practices.	10%	Investigation methods; resources required; execution plan; timeline; analysis and management of risks.	Appropriateness of investigation methods, resources required, execution plan, timeline, and risk management.
3. The document shall contain an updated description of expected project outcomes and deliverables.	5%	Project outcomes and deliverables – as updated from the project definition statement.	Appropriateness and achievability of outcomes and deliverables.
4. The document shall contain a detailed description of any preliminary experiments, validations, testing	20%	The recording of preliminary designs, implementations, simulations, experiments, validations, testing, and result evaluation.	Extent and quality of achievements so far.
5. The document shall be well-structured, coherent and polished.	20%	Structure and organisation; layout and format; expression, grammar and spelling; appropriate use of diagrams and tables; presentation of diagrams; appropriate length.	Quality of writing, diagrams, tables, etc.; Extent to which the document meets the requirement details.
6. The document format shall conform to the School's project document standards.	10%	<p>A maximum length of 80 pages of text, diagrams, tables and figures, not including the title page, executive summary, table of contents, references and any appendices.</p> <p>The format of 12 point font, 3.5cm left margin, 2.5cm margins on top, bottom and right side, one and a half (1.5) line spacing, printed only on one side.</p> <p>Inclusion of signed Assessment Cover Sheet.</p> <p>Include of an Occupational Health and Safety risk assessment of the work that will be carried out during the project.</p> <p>The document in hardcopy bound book form when submitted.</p>	Extent to which the document meets the School's project document standards.

3.5 Final Project Report Assessment

The Final Report is to meet the following objectives:

1. To update the literature review presented in the preliminary report
2. To describe what was done in the project.
3. To describe the management of the project.
4. To communicate the lessons learned during the project.

3.5.1 Requirements for the Document

The Final Report requirements, assessment weights and activity details are listed in Table 3.6. The report should be a stand-alone report of the entire project and as such should include much of what is in the preliminary report prepared at the end of Semester 1.

3.5.2 Additional Requirements

An electronic copy of the whole report in PDF format must be submitted to the supervisor. Each student should hand up a single CD to their supervisor containing the electronic copies of all project reports, design documents, final seminar presentation materials, and copies of any software and other documentation.

3.5.3 General Information

The submitted report will not be returned. It is recommended that students make an additional hardcopy of the report for their own use.

Additional guidelines and a suggested Final Report layout can be found in Appendix E.

Final Report requirements and assessment weighting

Requirement	Assessment Weight	Details	Measure
1. The document shall contain an updated detailed and critical literature review of past work relevant to the project.	10%	Review of all relevant literature	Extent of literature covered, appropriateness of literature reviewed and quality of the critical review.
2. The document shall describe the achievements of the project.	40%	The recording of research, designs, implementations, simulations, experiments, validations, testing, and result evaluation.	Quality of achievements.
3. The document shall describe the management of the project.	10%	The recording of : Project requirements; work breakdown; milestones and timeline. Group management practices (meetings, division of work, resolution of problems). Comparison of achievements relative to objectives and explanation of significant variances.	Quality of the recording, comparison and explanation.
4. The document shall describe the lessons learned from the project.	10%	The recording of problems encountered; solutions found; recommendations for future work.	Quality of the recording.
5. The document shall be well-structured, coherent and polished.	20%	Structure and organisation; layout and format; expression, grammar and spelling; appropriate use of diagrams and tables; presentation of diagrams; appropriate length.	Quality of writing, diagrams, tables, etc.; Extent to which the document meets the requirement details.
6. The document format shall conform to the School's project document standards.	10%	A maximum length of 80 pages of text, diagrams, tables and figures, not including the title page, executive summary, table of contents, references and any appendices. The format of 12 point font, 2.5cm left margin, 2.5cm margins on top, bottom and right side, single spacing. Inclusion of signed Assessment Cover Sheet. Include of an Occupational Health and Safety risk assessment of the work that will be carried out during the project. The document shall be spiral bound when submitted.	Extent to which the document meets the School's project document standards.

3.6 Research Paper Assessment

The Research Paper is to meet the following objectives.

1. To communicate the results of your project at the level of a technical journal/conference paper.
2. To allow your assessors to assess your ability in writing research papers.

The Research Paper requirements, assessment weights and activity details are listed in Table 3.7.

Research Paper requirements and assessment weighting

Requirement	Assessment Weight	Details	Measure
1. The research paper shall adhere to the guidelines corresponding to the journal or conference proceedings in which the paper is to be submitted.	25%	See your supervisor to determine a suitable journal or conference and then look up the guidelines for preparing papers for that Journal.	Extent to which research paper adheres to the guidelines for preparing papers for the chosen Journal or conference proceedings.
2. The paper shall be at a minimally competent standard suitable for publication in a technical journal.	75%	Does the introduction state the purpose of the paper? Is the significance of the paper, relative to the existing literature, explained? Is the paper clearly written and organised? Are there adequate references to other research? Is the paper coherent? Do the authors explain well <u>what</u> was done? Do the authors explain well <u>why</u> it was done? Relative to its content and scope, is the length of the paper appropriate? Is the English satisfactory?	Quality of writing.

Additional guidelines and suggested layout can be found in Appendix F.

3.7 Project Seminar Assessment

The Seminar is to meet the following objectives.

1. To present the results of the project.
2. To describe the management of the project.
3. To allow your assessors to observe and assess your technical presentation skills.

The Seminar requirements, assessment weights and activity details are listed in Table 3.8.

Seminar requirements and assessment weighting.

Requirement	Assessment Weight	Detail	Measure
1. The presentation shall describe the project background, objectives, results and outcomes.	30%	Purpose of project; applications; background; what was done and why; problems found; solutions; further work; recommendations; conclusion.	Quality of the content.
2. The presentation shall describe the management of the project.	20%	The description of: Project requirements; work breakdown; milestones and timeline. Group management practices (meetings, division of work, resolution of problems). Comparison of achievements relative to objectives and explanation of significant variances.	Quality of description, comparison and explanation.
3. The presentation shall be well-structured, coherent and polished.	40%	Logical order; cohesion; posture; voice clarity and projection; eye contact; engagement with audience; use of aids (slides).	Quality of the presentation and aids.
5. A useful discussion at the end of the presentation.	10%	Confident, relevant, succinct responses to questions.	Quality of answers to audience questions.

3.7.1 Additional Requirements

Students shall create seminar presentations in an electronic slide format and they shall be brought to the seminar on a portable memory medium (eg USB memory device).

Each group should provide a hard copy of their presentation (printed six slides per page) to their assessors at the start of the presentation.

Sessions shall start and finish on time as the assessors have to move between streams, but sessions shall not start until the assessors are present.

Students shall attend the other seminars in the stream in which their seminar is scheduled. No changes in the schedule for seminars are permitted except in special circumstances.

3.7.2 Assessors and Roles

The assessors shall be the project supervisor and the project moderator. The Chair of the seminar will be announced prior to the Masters seminar series.

3.7.3 Seminar Time and Location

The seminar timetable shall be posted on the course website 5 working days before the seminar series begins. The timetable provides the date, time and room of your seminar.

Digital projectors shall be available in every seminar room. If you have any requirements apart from a basic electronic slide presentation (i.e. MS PowerPoint and Adobe Reader), you must consult the Computing Officer at least one working day prior to your seminar presentation.

3.7.4 Presentation Guidelines

Additional guidelines can be found in Appendix G.

4 Resources for Projects

4.1 Computing Facilities

The Computer Aided Teaching Suite (CATS) allows PC access to masters students for project work. This equipment carries a number of specialised software packages. In addition Masters students undertaking a project based in the School of Mechanical Engineering may access the computers in the mechatronics lab in the School of Mechanical Engineering (S311b, Level 3, Engineering South)

To use these PCs, the student should

1. seek permission from your project supervisor
2. contact the School Office in S116 for obtaining an access card
3. contact the Engineering CATS manager on level3, Engineering South for obtaining a computer access account for CATS computers.
4. Contact the Mechanical Engineering School Computing Officer to obtain an account on the Mechatronics lab computers.

4.2 Budget

Each project will be given a specific amount of budget limited to **\$1000** to cover all items including travel, consumables and capital purchases. However, the amount of the budget differs from case to case and it will be clarified by your supervisor. If your supervisor has any additional fund he/she may be able to increase the funding level to the need of the project, especially for purchasing any essential equipment/consumables etc needed for the project.

4.3 Technical Support

During the planning stage of your project you can seek advice on system manufacture or equipment availability from the Senior Technical Officers listed on the Student Handbook. They may direct you to other members of the technical staff for more detailed discussion. However your supervisor should be your first port of call for all questions and he/she will direct you to the appropriate source of information.

For industry sponsored projects, any component manufacture or purchase will be the responsibility of the project sponsor. For university projects, any component manufacture will require you to submit your technical drawings, approved by your supervisor, to the Senior Technical Officers involved in your work who will allocate workshop time to your job. You are encouraged to submit your jobs to the workshop as early as possible. You should address queries about the progress of your job to the Senior Technical Officers.

4.4 Project Software

a. Project Management Software

You will be required to make use of one of three packages of project planning software available on the engineering network computers in CATS. These are "ganttproject", "openproj" and "openworkbench". Your Project Plan and Preliminary Report must contain at least a Gantt Chart prepared using this software.

b. Australian Engineering Information Package

This software provides an easy way of searching for the names and addresses of Australian suppliers of particular components, materials and equipment items you may wish to use in your project work.

4.5 Literature Resources

The following references are useful when preparing reports and seminar presentations.

1. D. Beer, D. McMurrey, *A Guide to Writing as an Engineer*, 2nd ed. New Jersey: John Wiley & Sons, Inc., 2005.

This book contains guidelines and tips for engineering writing (Chapters 2 and 3), report writing (Chapter 6), information search (Chapter 8) and seminar presentation (Chapter 9).

2. <http://www.mhhe.com/mayfieldpub/tsw/toc.htm> Accessed Nov.24, 2005.

This website contains details guidelines for writing reports.

Additional guidelines for writing reports and presenting seminars can be found in the Appendices of the Masters Project Handbook and the course website.

Appendix A: Getting Started

This appendix contains some general advice for undertaking your project.

A.1 Project Startup Checklist

Getting your project off to a good start is an important step to a successful outcome. The following information gives you a guide on how to start your project. Note that you should be spending about 20-25 hours per week on your project. It is important that you make this time available, especially at the start of the project.

1. Determine Supervisor and project, and arrange a Meeting

Select your project and supervisor based on the area in which you wish to work from the design and research project data base in the School of Mechanical Engineering. See <https://www.mecheng.adelaide.edu.au/mastersprojects/>. The supervisor will be listed on the data base. Alternatively, if you wish to do a project of your own in a particular area, consult the web page, <http://www.mecheng.adelaide.edu.au/people/>, for a staff member with expertise in the project area and approach that staff member requesting that he/she supervises your project.

In either case you must arrange a meeting with your supervisor by email. This meeting must occur no later than the first day of semester.

2. Enrol For and Attend a Literature Search Seminar

An important part of the project is a critical survey of existing published material relating to your project investigation. This involves locating, reading and analysing the relevant material. To help you locate such material, a Literature Search Seminar will be arranged with the Engineering Research Librarian at the Barr Smith Library. She (or he) will explain how you can find out more information about your particular topic using the electronic resources. Please see the Masters by coursework coordinator about enrolment details.

3. Attend Talk on Laboratory and Computing Facilities

All students undertaking projects in the School of Mechanical Engineering are required to attend a talk by the Laboratory Manager and the School Computing Officer in Week one. The Laboratory Manager will discuss the use and availability of laboratories, (including S311b, S311c and S237), and safety in the workplace. The Computing Officer will outline the computing facilities in the School and the CATS, and will discuss the rules and regulations when using the facilities.

During the planning stage of your project, you can seek advice on computing facilities or equipment availability from the Computing Officer and the Laboratory Manager. They may direct you to other members of the technical staff for more details.

4. Purchase a Laboratory Notebook and Bring to First Meeting

Each student must maintain a project workbook. This should be a daily diary of your progress and should include notes from all meetings, problems encountered, decisions made, design ideas and sketches, references to data sources, calculations, equipment settings, experimental results etc.

A good workbook forms a valuable record of your work, which you can refer to in later parts of your project and is an excellent source of information for your final report. The workbook must be kept up to date as you progress through your project.

Workbooks are submitted with your project report and are taken into account in assessment. They should always be brought to the project meetings.

University of Adelaide Good Practice Workbooks can be purchased from The School of Mechanical Engineering Office (S116).

5. Meet with your Supervisor

At the first meeting your supervisor will explain the aims and objectives of the project, and the deliverables expected on completion of your project work. The supervisor will also give you some background information and pointers for starting your literature investigation.

The supervisor's role is to provide advice and guidance, and to ensure that your project proceeds in a fruitful direction. You should not expect your supervisor to do your thinking for you, or give you detailed step-by-step instructions on what to do. You are expected to generate your own ideas, to seek out information for yourself, and to make your own decisions about what to do and how to do it.

At this first meeting, arrangements are normally made for regular (usually weekly) meetings. Note that it is the responsibility of the student to keep the supervisor informed of progress on the project.

6. Begin Writing Your Project Definition Statement and Project Plan

The project definition statement must be given to your supervisor within 1 to 2 weeks of beginning the project. This allows the supervisor to check that you have properly understood the project aims and expected outcomes and ensures that the project is off to a good start. If you have an industry sponsor supervisor, then the project definition statement should first be discussed with that person.

The project plan forms your roadmap for the project and it must be completed by the end of week 6. It should describe why the project is important, what has been done before, and clearly explain what you are aiming to achieve and how you plan to go about it. More information on the content of the project plan is described in Appendix D.

Note that the project plan is only an initial plan and the actual course of the project may change during the year. Major changes are possible but they should be carefully discussed with your supervisor before proceeding.

7. Begin Preparing Your Preliminary Report, Final Report and Research Paper

It is a common mistake to begin your mid-project and final project report a week or two before it is due. It is at this time that you may be busy doing the technical work on your project and can least spare the time required.

The best practice is to write up your reports as you go along. A good technique is to create a word processor document at the beginning of the year as your "electronic workbook". As you progress through the project, you should draw key figures and store them in this document. You can also include key results from simulations and experiments, and photos of equipment etc. This will save you substantial effort at the end of the project, as you will already have the majority of the figures and data for your report.

As you complete each section of work, which may form a chapter in your final report, it is worthwhile highlighting important aspects to be covered in the chapter.

Using the above approach, you will find it much easier to complete your final report at the end of the year. You will also easily recognise if you are missing important information from the report.

A.2 Some Good Advice

Take your project plan very seriously. The work you do planning and researching your project at the start can make an enormous difference to the quality of your project.

Break the project into small tasks (no bigger than 2 weeks).

Assign a deliverable (or milestone) to each task. Make sure they are things you can demonstrate.

Do not just assign blocks of time to 'learning', 'researching', or 'choosing'. Specify what the demonstrable, useful, outcomes of this activity will be for example:

If you need to learn a new piece of software then use it to do something useful.

If you need to learn a new programming language then specify a small, useful program you will write in the language. If you need to do some research then specify the questions you will answer and how you will present the answer.

If you need to make a decision then produce an interim report which compares the alternatives and justifies the decision.

Do not just put 'documentation' or 'writing-up' as a big task performed in parallel with the rest of your project. Break the documentation down into smaller steps with deliverables. (Interim reports are one way of writing your report as you go. Each interim report can eventually form a section of your final report.)

Breaking up a project like this is hard, especially at the start when you do not fully understand the project, but that is when you must do it. If you do not have a plan at the start of the project, you will not have one until it is too late.

In your reports, consider breaking the background into 2 sections, motivation and background theory.

In the motivation sections you need to describe the context (or big picture) of the project. You need to write just enough to allow the reader to understand why your project is important and interesting and what the likely constraints of the project are.

It is sometimes helpful to present background theory in your reports. You should present enough theory to help the reader (e.g. one of your classmates) understand the report.

When things go wrong with your project:

If you fall behind your schedule you must either re-design your schedule or work hard to get back on track.

If the project is not going well, let your supervisor know. Do not leave it to the last minute to try and get things back on track.

Do not let anyone or anything hold you up. You may have to wait for software to be installed. You may have to wait for parts to be delivered. You may have to wait for the workshop to complete construction of some crucial experimental equipment. You may have to wait for your supervisor to answer your questions. Do not let these things stop you. Find another part of your project to do, find a way around the problem, get help from someone else or fix the problem yourself.

Things will go wrong. How you handle problems is an important aspect of the project. Fix the problems and don't just blame other people.

Appendix B: Student Performance Guidelines

The project is a miniature version of projects which you may encounter in your working environment. It is an opportunity for you to learn new technical skills. The project requires that you use your own initiative. You are required to plan what is required and then execute it.

The first semester project performance is based on your progress, the meetings with your supervisor and your project workbook. This workbook must be kept up to date and submitted to the supervisor at the end of the first semester and at the conclusion of the project.

Enthusiasm and initiative are important. This is **your** project and you need to take responsibility for it. It is not uncommon that as you progress through the project, you will encounter unexpected difficulties. It is from overcoming these challenges that you will learn the most about research. The methods that you use to solve these problems can form a significant part of your final report and seminar.

When you encounter difficulties, the key thing is not to panic. You should assess the issues, develop a plan (and maybe a back-up) and then discuss this with your supervisor. Especially in the later stages of the project, if you feel that you will probably not be able to complete all the objectives, then you should discuss priorities with your supervisor.

Remember that the main aim of the project in terms of its contribution to your education is not simply for you to accomplish all the goals your supervisor has set out for you (though clearly this is important!). The educational aim is to give you an opportunity to learn and demonstrate key research skills such as self motivation, methodical approach to research, time management and the ability to tackle challenging problems. If you demonstrate that you are dedicated and diligent in tackling your project, you should do well, even though you may not achieve all the original project goals.

Appendix C: Project Workbook Guidelines

The project workbook is a record of the work that you did for the project. The workbook is sometimes referred to as the log book or lab book.

University of Adelaide Good Practice Workbooks can be purchased from The School of Mechanical Engineering Office (S116).

Choose a notebook you are comfortable with. An A4 hardback bound book with numbered pages would be a good choice.

Write your entry in English. Your supervisor and moderator may read the workbook to assess your performance.

Date each entry, including time of day.

Record all your ideas. The workbook can indicate the progression of your thoughts.

Record all work performed. Even mistakes are useful to enter so that they are not repeated by your successor.

Record any assumptions made.

Record all references used.

Record all problems encountered.

Record all precautions and procedures taken.

Record from where or whom you obtain equipment, devices, special tools, etc.

State model number and make of all equipment and devices used.

State software and version used.

Include sketches, drawings, diagrams, and schematics. Label diagrams and graph axes.

At the end of each project semester, write a two-page summary.

Appendix D: Project Definition Statement and Project Plan Guidelines

At the first project meeting, your project supervisor will explain the aims of the project. The project definition statement is an opportunity for you to clearly explain back to your supervisor what you think is required. It should clearly state the aims and objectives of the work, the project requirements and the expected outcomes, which include the deliverables that you are promising.

The project plan should be a detailed plan describing how you will go about achieving the outcomes stated in your project definition statement. It should also give a list of milestones with corresponding dates and clearly separate the required tasks into individual roles and include the project definition statement.

You should discuss with your supervisor the content of the project definition statement and project plan as different projects may require different aspects to be covered.

After submission of the project plan, your supervisor will provide feedback on it and may suggest changes before the project proceeds further. You should update your project plan to document any agreed changes.

During the course of the project you may find that you will need to make major changes to your project plan. In this case you should consult with your supervisor before proceeding. Managing changes in an orderly manner is a key part of project management.

D.1 Suggested Project Definition Statement Layout

The project definition statement should be one to two pages in length. It should begin with the project title and include the student name and ID number. This should be followed by a brief description of what the project is about, what the objectives are, what the expected outcomes are and what the deliverables will be.

D.2 Suggested Project Plan Layout

Title Page: This should include the project title, the words "Project Plan", followed by the group number and member names, and the date submitted.

Executive Summary: In 100 to 200 words of plain language, summarise the aims of the project plan. Briefly, what is the project trying to achieve?

List of Definitions and Acronyms: The definitions of all terms, acronyms and abbreviations required to properly interpret the document are provided in this section.

Table of Contents

Introduction: This section briefly explains what the document is and why it has been produced. The introduction should include:

- identity of client – the organisation for whom the work is to be done
- a short description of the project

Background: This includes:

- the importance of the project
- circumstances leading to the current project
- work already carried out in the area of the project
- applications of the project results
- the critical issues relevant to the project

Literature review: The literature review must be a critical review of any published work relevant to your project. Don't just state what others have done. Relate it to your project and identify any knowledge gaps that will be addressed by your project. Give opinions regarding the published work, especially if you think it is incomplete, that it challenges existing knowledge or if it disagrees with other published work.

Project Objectives: The objectives must define what is to be achieved and the method of measuring the extent of the achievement.

Constraints: This sets out the constraints that affect the project decision and management. Constraints include:

- externally imposed time scales
- limitations on the people who can be approached for information.

Methods and Techniques: This section describes and justifies the development strategy chosen for the project. It describes the approaches, methods and techniques to be used during the requirements specification, implementation, verification, validation and test.

The necessary environment and equipment for testing should be described. During testing, considerable pressure will normally be put on the test equipment. Therefore, this activity should be planned carefully.

Project Requirements: This is a numbered list of identified project requirements.

Project Outcomes: This is a numbered list of all the products or deliverables that the project will produce, such as hardware, documentation and reports. The numbered list of deliverables will be used to associate with the activities in the work breakdown structure.

Work Breakdown: This describes the work breakdown of the project into activities and identifies milestones and deliverables associated with each activity. For each activity, define:

- pre-requisites: what has to be done before this activity can start
- dependent activities: activities that need this one to be completed first
- estimated time/effort: this may be a range of values
- quality checks: details of how you are going to verify and validate the product of the activity

Project Schedule: This describes the dependencies between activities, the estimated time required to reach each milestone.

What are the key milestones/tasks during the course of your project? When do you expect to accomplish these milestones? Can tasks be done in parallel? How can the project be organised to make the most efficient use of the time available (what is the critical path)? This information is helpful for both you and your supervisor to keep track of your progress on the project as it allows you to compare your progress versus your original schedule.

This section should also include a project Gantt Chart produced with one of three packages available on the engineering network computers in CATS. These are "ganttproject", "openproj" and "openworkbench".

Resources: This describes hardware/software tools, laboratory facilities and library resources needed to support the project work. You have a limited budget. What hardware, software, test equipment etc will you need to complete the project? Are these already available in the school? If not, how much will these cost? It is important to take into account that certain specialised parts may take a significant time to purchase and this should be factored into your timeline.

Risk Analysis: This describes possible project risks. Typically this might include:

- unavailability of resources
- damage to key hardware components
- technical problems (such as software bugs or faulty hardware parts).

You should give a priority ranking to each potential risk. A simple method is to allocate to each risk a probability rating (1-10) and a seriousness of impact rating (1-10). Multiplying the two gives an overall score for priority purposes. For the most serious risks (those with the highest scores), preventive measures to reduce or remove the risk should be specified. You can use other methods to rank risks.

Monitoring Mechanisms: This describes the project monitoring, reporting and control mechanisms used.

References: Include a list of references and web links related to the project.

Appendix E: Preliminary Report and Final Report Guidelines

E.1 Suggested Layout

Title Page: This should include at the centre of the front cover the project title, the words Final Project Report, followed by the group member names, the commencement date and the submission date.

Executive Summary: In between 100 to 200 words of plain language, give a concise summary of the project aims, background, general approach and key results.

Acknowledgements

List of Definitions and Acronyms: The definitions of all terms, acronyms and abbreviations required to properly interpret the document are provided in this section.

List of Figures (optional)

List of Tables (optional)

Table of Contents: A Chapter/Section/Subsection numbering scheme should be used and thus Section 4.3 will be the third section in the fourth Chapter. Chapter 1 is normally the introduction. The page numbering should start from page 1 as the first page of the Introduction.

Introduction: This contains the aims/objectives, background to project, requirements/specifications, system description and organisation of the document.

Literature survey: This contains a **critical** review of literature that is relevant to your project.

Several chapters covering your technical contributions to the report, describing the system models if appropriate. This section will be much more extensive in the final report and may be quite short in the preliminary report

- the analysis methods and simulations if appropriate
- the method used to solve the problems
- the experimental testing and results if appropriate

Project management description: timeline, key milestones, budget, discussion of any differences between the project execution and the original plan due to aspects such as technical difficulties/changes in project aims, discussion of other project management issues faced, how they were overcome and lessons learned. Again, this section may be quite short in the preliminary report, but should be covered thoroughly in the final report.

Conclusions: summary of key results from the project, possible future work, advice to students continuing project (if appropriate).

References: use of other people's research and work must be properly and accurately acknowledged. This means including a complete reference list and indicating within the text where use has been made of items in the reference list. A large part of our knowledge is taken as known standard work for which references are not expected - be guided by the actual use you make of published work. Use the format suggested in page 238 of D. Beer and D. McMurrey.

Appendices: These give information which may be useful for reference purposes and may include items like copies of key reference papers, datasheets, experimental data, full circuit diagrams, software listings, detailed analytical derivations, mechanical drawings etc.

E.2 General Comments

The project report will be assessed not only on its technical content, but on its effectiveness in communicating information. The standard of written expression, including sentence construction, grammar, spelling, organisation into paragraphs, as well as the overall arrangement of the subject matter will be taken into account.

The above information covers general project reports. As each project is different, it is recommended that you discuss the particular reporting requirements of your project with your supervisor. It is often helpful for you to draft out a table of contents showing the chapter titles and sections and check this with your supervisor.

The captions for figures should be placed below the figure and the captions for tables should be placed above the table.

Appendix F: Research Paper Guidelines

Research papers must follow the guidelines provided by the journal to which they will be submitted. Your supervisor will provide advice on an appropriate journal. Alternatively, you may submit a paper to a conference if you or your employer or supervisor can find the funds to send you to it.

F.1 Suggested Layout

Title: Use a clear, specific and descriptive title. The title should be detailed enough to give a specific idea of the scope of the paper.

Authors and affiliations: (ie who contributed to the paper – in order of the amount of contribution - and where do they work)

Abstract: This is a brief summarizing statement in the form of a paragraph, usually with 5-10 sentences. It gives the reader a synopsis of the problem, method, results, and conclusions of your paper.

Introduction: This usually does the following: (1) state the subject of your paper, (2) define the problem you are addressing, your approach to the problem, and the importance of this problem, (3) state the purpose of your paper, (4) define the scope of your paper, and (5) provide necessary and relevant background information. The background may include a historical summary of the problem being addressed, a brief summary of previous work on the topic (literature review with references), and the specific reasons as to why the paper is being written.

Theory, modelling or design section: This section covers analytical or numerical models or designs

Experimental or simulation section

Results: Present data, estimates of their accuracy and critically evaluate your findings

Discussion: When writing this section, bear the following points in mind.

- Identify significant patterns in the data and relationships between variables. Provide possible explanations for these patterns and relationships.
- Compare the actual results with any predictions or questions posed in the introduction or theory section of the paper.
- If any of the results differ from the expected results, offer possible explanations for the discrepancies.
- Consider how well the data answer any questions posed in the paper's introduction.
- Qualify the scope of your explanations, discussing in what cases your explanations apply and in what cases they may not.

Conclusion: Relate your findings to the general problem and any particular objectives described in your introduction. Summarise what the paper does and does not demonstrate. Include specific recommendations for further research.

References: Include a list of sources used in your paper. Use the format suggested in page 238 of D. Beer and D. McMurrey.

Appendix G: Seminar Presentation Guidelines

Seminars should be aimed at the technical level of the student audience. As they may be unfamiliar with the topic, clear explanation should be given to the overall background, nature, scope and aims of the project.

As a general rule, the number of slides should not exceed the number of minutes allotted for presentation. Thus for a 15 minute presentation, no more than 15 slides should be used.

Digital projectors shall be available in the seminar rooms. You shall follow the instructions on the digital projectors for turning them on and off. If these instructions are not followed, the projector lamp could be damaged and the projector may not be available for use during the seminar period. If you have any questions about the use of these projectors please see the Laboratory Manager.

Hints on the Presentation

- Plan out your talk coherently and well in advance before the presentation.
- Establish eye contact.
- Project confidence.
- Dress neatly.
- Use large font on slides (minimum 22 point).
- When you show a graph, explain the axes first. Also make sure that the graph labels are in large easy to read font.

Project your voice clearly.