<This page shows the required format for the title page of your report. Please stick strictly to the font sizes and placement of the text. Your individual Project Report Number must be included on this page as shown below>

PROJECT IN MECHANICAL ENGINEERING or MECHATRONICS

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TITLE OF YOUR REPORT HERE

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R. N. Sharma

Project Report ME00-2014 or MT00-2014

Co-worker: K. Jayaraman

Supervisor: Prof. B. Mace

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Department of Mechanical Engineering
University of Auckland

03 March 2014

<12pt >

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INSTRUCTIONS AND ADVICE RELATING TO MECHANICAL ENGINEERING or MECHATRONICS PROJECTS

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R N Sharma

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ABSTRACT

The Part IV Research Project in Mechanical Engineering and Mechatronics provides an opportunity for students to work under supervision, largely on their own initiative, on some topic of interest in Mechanical Engineering or Mechatronics. It counts as two papers, one in each of the two semesters, and the project work takes place over a complete academic year.

The aims of the project are to undertake problem formulation, management and solution; to acquire technical, personal and professional competencies; and to learn and practice communication skills.

The project is made up of the following components: an electronically submitted project report of no more than 25 pages (worth 50% of the final grade), together with an electronically submitted abstract of no more than 250 words; a mid-year progress report (10%); a formal seminar presentation of 25 minutes per project group (10%); a display for the general public and invited guests from industry (10%); and on-course assessment by the supervisor for each semester (10% each, total 20%). To pass the projects course, it is mandatory for the student to obtain a pass grade for the final report, in addition to obtaining a overall pass grade. Only those reports that pass will be sent to the library for archiving.

All students are also required to submit in March a safety sheet and a specification for the project in the form of an abstract and planning schedule. The safety sheet needs to be submitted in order to get permission to work in the laboratories; the specification is necessary to plan the work.

This handbook gives all necessary details for the project and its various components.

< The word “ABSTRACT” should be centred in 14pt bold upper case, while the content of the abstract section must be in 12pt. The abstract text should be indented by 40 mm on the left hand side and 30mm on the right. The abstract should be no longer than 250 words; it must summarise the objectives, results and conclusions of your project. >

Table of Contents

Acknowledgements

The Projects Courses and the manner in which these are run have evolved over many years with input from many academic staff and others within the Department of Mechanical Engineering. Their contributions are gratefully acknowledged.

Alongside, the Projects Handbook has evolved as well, again with contributions from a number of staff. Thanks are due in particular to Heather Silyn-Roberts (now retired), Krishnan Jayaraman, Robert Raine, Debes Bhattacharyya, and others.

MECHENG 762A/B; 763A/B: Final-Year Project 2014
Schedule of critical dates: deliverables, events, seminars

Seminars **Semester 1: Conference Centre 423-342** **Tuesday 2.00 pm**
Semester 2: Eng3404 / 403-404 **Monday 2.00 pm**

Key
Seminar
Submission of deliverables

SEMESTER 1			
Wk	*Date*	*Seminar Topic / Deliverable / Task / Event*	*Personnel*
1	Tue 4 Mar	Introduction to projects	R Sharma, K Jayaraman, K Aw
	Fri 7 Mar	Project registration to be completed with project partner and supervisor. If not, choose preferences online for dept to allocate project and supervisor.	
2	Tue 11 Mar	Safety	Jos Geurts
3	Tue 18 Mar	The library and literature search: resources, doing literature searches. Also: library tutorials. Emil will give details of times.	Emil Melnichenko (*Library*)
	Thu 20 Mar	1. Safety sheet submission: to technician in your lab 2. Abstract and planning schedule submission online by 5pm	
4	Tue 25 Mar	Literature review and write-up	Krishnan Jayaraman
5	Tue 1 Apr	Manufacturing capabilities and procedure	X Xu, Technical Heads
6	Tue 8 Apr	Design of experiments	Richard Flay
	14 – 25 April: Mid-semester break		
7	Tue 29 Apr	Simulation tools and resources	R Sharma, Kean Aw, R Das
8	Tue 6 May	Intellectual property	Duncan Schaut (*Baldwins*)
9	Tue 13 May	Mid year project report write-up	R Sharma, M McCarthy
10	Tue 20 May	Word processing and documentation	Hazim Namik
11	Tue 27 May	Data processing and presentation	TBA
12	Tue 3 Jun	No lecture / seminar	
Inter Sem Break	Tue 8 Jul	Mid-Year Progress Report submission: 1. Hard-copy to Mech Office, Level 9, by 5.00 pm; AND 2. Online submission by 5pm: details TBA	

SEMESTER 2			
Wk	*Date*	*Seminar Topic / Deliverable / Task / Event*	*Personnel*
1	Mon 21 July	Mid year project presentation	R Sharma, M McCarthy
2	Mon 28 July	Mid year project presentation CLINIC	R Sharma, M McCarthy
	Wed 30 July	Mid-year project presentations, Conference Centre, DAY 1	
3	Mon 4 Aug	Mid year project presentation CONSULTATION IN STAFF OFFICES	DEPT STAFF
	Tue 5 Aug	Mid-year project presentations, Conference Centre, DAY 2	
	Wed 6 Aug	Mid-year project presentations, Conference Centre, DAY 3	
4	Mon 11 Aug	Project report write-up, Lecture 1	R Sharma, M McCarthy
5	Mon 18 Aug	Project report write-up, Lecture 2	M McCarthy, Other TBA
6	Mon 25 Aug	Project conference presentation	Krishnan Jayaraman
	1 September - 12 September: Mid-semester break		
7	Mon 15 Sept	Project report write-up, CLINIC 1	TBA
8	Mon 22 Sept	Project report write-up, CLINIC 2	TBA
	Wed 24 Sept	Final report (with Appendices) online submission as ONE file by 5.00 pm (absolute deadline); severe penalties for being late	
	Thu 25 Sept	Project abstract (1 page) online submission as a file by 5 pm	
9	Mon 29 Sept	NONE (Systems Engineering Week)	
10	Mon 06 Oct	Conference presentation and displays, INFO SESSION	Rajnish Sharma
11	Mon 13 Oct	No lecture / seminar	
	Tue 14 Oct	Pdf poster file submission to S-drive by 10 am for dept printing	
	Sat 18 Oct	Project conference presentations: Rooms: Eng 3.401, 3.402, 3.403, 3.404 and 1.401	
12	Mon 20 Oct	Project wrap-up SESSION	Rajnish Sharma
	Thu 23 Oct	1. Project displays, Mechanical and Mechatronics laboratories 2. Functions night: Project dinner and prize giving, Atrium (L3)	
Study break	Tue 28 Oct	Project completion checklist (back of safety form) signed off by (1) Lab technical staff, and (2) Your supervisor. THIS MUST BE DONE AFTER DISPLAYS DAY. Submit to Mechanical Office, Level 9 by 5.00 pm.	

1.0 Nature, Scope and Aims of the Final Year Project

The Part IV in Mechanical Engineering and Mechatronics provides an opportunity for students to work under supervision, largely on their own initiative, on a topic of interest in Mechanical Engineering or Mechatronics.

The project can also be seen within a professional context where as an engineer, the student has to investigate a particular problem in some depth and produce both an analysis of the problem and its solution. For these, the student will need to draw upon a good level of knowledge and skills, both theoretical and practical, acquired in the degree programme, and extend these in many respects. The basis of the solution must include a formal report, a conference presentation, and an industrial display.

Some projects are primarily laboratory work; others involve a substantial liaison with local industry and yet others may be more analytical or computational. The topics offered are as wide as the interests of the members of staff in the Department, and may fall under one or more of the following areas: Acoustics, Aero/Fluid/Hydro Dynamics, Dynamics and Control, Industrial and Manufacturing Systems, Mechanics of Materials and Manufacturing Processes, Systems Engineering, Thermodynamics and Heat Transfer, and Mechatronics.

It may not be possible for every student to work on the project of his or her own first choice, but everyone should be able to find a topic in which they have a strong interest. Each project topic is assigned to a pair of students who work as a team. However, the following elements of the project are separately assessed: the mid-year progress report, final report, the conference presentation, and the quality of performance in the two semesters. Individual grades are awarded for the project and a pass grade must be obtained for the final report, in addition to a passing overall grade, to pass the course.

The project work should occupy ten timetable hours per week, plus a supervision hour, and extends from March through to early October.

The general aims of the Part IV project may be summarised as follows:

- **To undertake problem formulation, management and solution**
  Planning in some detail, problem formulation, scheduling the year's work, and completion to the deadline. In addition, you must take into account the availability of equipment, technician support, etc.
- **To acquire technical, personal and professional skills**
  Self-discipline, specialised learning, attitude of a professional engineer, and working with others.
- **To learn and practice communication skills**
  This will include your relations with other people (supervisor, project partner and technical staff), and formal reporting (oral, written and display).

The performance of the student will be assessed on how well these aims have been achieved. It is also hoped that students will feel a personal sense of achievement by the end of the project.

2.0 Project registration

Each project is undertaken by a pair of students. All students are therefore strongly encouraged to confirm project partners and then register for projects with supervisors as soon as possible. It should be noted that each academic staff member does not accept more than four projects; some supervisors will be fully booked up early.

Once a project partner with a common interest area(s) has been identified, a project and a supervisor will need to be confirmed. To do this, students need to visit the departmental Part IV Project webpage www.mech.auckland.ac.nz/uoa/mech-part-iv-projects. From this list, students may decide on possible projects and supervisors. There may be supervisors that the student pair is interested to do a project with but who have not listed their projects. This does not necessarily mean that these supervisors do not have projects to offer. Student pairs are also welcome to propose project topics of their own.

In any case, students should then visit and discuss their interests with the supervisors; or send them an email. Project preference(s) once determined must be registered with the supervisor(s) concerned and if the project is still available, the supervisor may confirm the project for the student pair. Once a project is confirmed, the supervisor will need to pre-allocate the project to the student pair on the online system. This will complete the project registration. The proposals list page may be checked to confirm that names of the student pair appear against the project that has been allocated. If not, then you must alert the supervisor.

It should be noted that: (a) If a student pair later decides not to take up an already confirmed project, then *the student pair MUST inform the staff member of their decision*; (b) Those who have not registered by the end of

Week 1, Semester 1, 2014, will be required to visit another part of the online system to select their preference areas, who will then be allocated by the department into a pair and a project; and (c) No more than one single-person project is allowed. This will occur only when there are an uneven number of students in the class.

3.0 Formal Requirements of Papers Mecheng762A/B and Mecheng763A/B

Students are expected to work consistently on their final year project throughout the year, meet with their supervisors on a regular basis to discuss their progress and goals, and attend all the scheduled presentations and seminars. The supervisor awards project conduct marks to each student, in each of the two semesters. Students are required to submit a mid year progress report and a final report, deliver a presentation on their project, and provide a poster demonstration on the displays day. Every project student will be assessed in each of these components and must obtain a passing grade overall as well as for the report, to pass the project course.

There are strict timetable constraints, so no extensions will be possible for the reports, apart from extensions according to the standard University aegrotat / compassionate pass regulations. In such a case (a) the unfinished report would still need to be submitted by the deadline, and (b) a completed report then needs to be submitted at the earliest within any extension period, specified in any University recognised medical or professional report or as determined by the head of department. The report would still be assessed according to the University aegrotat / compassionate pass regulations and the departments standard assessment criteria. Late report submissions outside of the University aegrotat / compassionate pass regulations will carry severe penalties. The University aegrotat / compassionate pass regulations will also apply to the conference presentation and display, in which case the corresponding assessment will be at the discretion of the head of department.

4.0 Seminars and lectures

A number of lectures / seminars are scheduled in each of the two semesters, as in Table 1, that will cover various aspects of the conduct and management of the project. Some lectures will also cover the mechanics of report writing and conference presentation; while some others will be 'clinic' oriented to provide practical guidance on matters such as word processing and documentation, data processing, and preparation of presentations. A number of lectures will be used to communicate policies and procedures and the tools and resources that are available for project work. *Students will be expected to attend all the scheduled presentations and seminars.*

Table 1 Final year project seminar / lecture schedule for 2014

SEMESTER 1: 2.00 - 3.00pm, Tuesdays, Conference Centre Lecture Theatre / 423-342		
Week	**Topic**	**Staff (2014)**
1	Introduction	Rajnish Sharma, Krishnan Jayaraman, Kean Aw
2	**Safety**	Jos Geurts
3	Library and literature search [#]	Emil Melnichenko (*Library*)
4	Literature review and write-up	Krishnan Jayaraman
5	Manufacturing capabilities and procedure	Xun Xu, Technical Heads
6	Design of experiments	Richard Flay
7	Simulation tools and resources	Rajnish Sharma, Kean Aw, Raj Das
8	Intellectual property	Duncan Schaut (*Baldwins*)
9	Mid year progress report write-up	Rajnish Sharma, Martin McCarthy
10	Word processing and documentation[##]	Hazim Namik
11	Data processing and presentation	TBA
12	No seminar	---

SEMESTER 2: 2.00 - 3.00pm, Mondays, Eng3404 / 403-404		
Week	**Topic**	**Staff (2014)**
1	Mid year practice presentation	Rajnish Sharma, Martin McCarthy
2	Mid year practice presentation *CLINIC*	Rajnish Sharma, Martin McCarthy
3	Mid year practice presentation *CONSULTATION*	*Individual staff in their offices*
4	Final report write-up	Rajnish Sharma, Martin McCarthy
5	Final report write-up	Martin McCarthy, Other
6	Project conference presentation	Krishnan Jayaraman
7	Final report write-up *CLINIC*	TBA
8	Final report write-up *CLINIC*	TBA
9	No seminar (Systems engineering week)	---
10	Conference presentation and displays *INFO*	Rajnish Sharma
11	No seminar	---
12	Project wrap-up session	Rajnish Sharma

[#] *Details of library tutorials will be given. Procedure for booking into tutorials will be provided.*
[##] *A word processing clinic may be organised in the computer labs. Details will be provided in this lecture.*

5.0 Deliverables, submission dates and procedure, and assessment

Table 2 below summarises the key deliverables (or tasks) for the project, with submission or completion dates and procedure, comments on grading, weighting, and method of assessment.

Table 2 Project deliverables and key tasks

SEMESTER 1				
Deadline 2014	***Deliverable / Task***	***Submission or completion procedure (Summary)***	***Marks or grade***	***Assessor(s)***
Fri 7 March (Week 1)	**Project registration**	*****1 per project pair. *****Register with supervisor – registration completed online by supervisor. (Also see section 2)	None. If not registered by Fri Wk 1, dept will allocate topic and supervisor.	
Thu 20 March (Week 3)	**Project safety sheet**	Hard copy submitted to technical staff in the assigned lab. If there is no lab work: submit to Ken Snow, Manufacturing Systems lab, Level 3.	None. No lab work permitted until completed.	
Thu 20 March (Week 3)	**Abstract and planning schedule**	*****1 per project pair. File name format: Supervisor-UPI1-UPI2-APS2014.pdf e.g. MaceB-jblo123-jdoe456-APS2014.pdf *****Submit file to S-drive: S:\Mech\Submit\MechEng762\APS\ S:\Mech\Submit\MechEng763\APS\	Included in first semester's on-course assessment.	Supervisor
End of Sem 1	First semester's work		10% Graded	Supervisor
Tue 8 July (Inter-sem break)	**Mid year progress report**		10% Graded	Supervisor

SEMESTER 2				
Deadline 2014	***Deliverable / Task***	***Submission or completion procedure***	***Marks or grade***	***Assessor(s)***
Wed 30 July to Thu 5 August (Weeks 2 and 3)	**Mid-year practice oral presentations**	Attend practice session as scheduled	None. Practice session	Not assessed
Wed 24 September (Week 8)	**Final report** with appendices, submitted digitally as ONE file.	*****Online submission details to be announced (TBA). *****Reports submitted after 5.00 pm will be severely penalised.	50% Graded	2 academic staff: 1 expert and 1 from another area.
Thu 25 September (Week 8)	**Project abstract**	Online submission details to be announced (TBA).	None. For publicity.	Not assessed
(Week 11 / 12) *Tue 14 October for dept printing *Thu 23 Oct for self-printed poster	**Poster submission**: *Either: Digital file for printing by dept; *Or Bring printed poster along	*****Online submission details to be announced (TBA). *****Or Bring printed poster along on displays day		
Sat 18 October [Rms: 3.401, 3.402, 3.403, 3.404, 1.401] (Week 11)	**Project conference presentations**	*****Load Powerpoint presentation onto desktop before start of session *****Deliver as per instructions *****Attend any 3 sessions	10% Marked out of 35	Two members of department academic staff.
Thu 23 October [Poster: submitted previously as above] (Week 12)	**Project displays**. (Followed by project function and awards ceremony)	*****Setup completed by 12 noon in allocated lab, ready for judges/others. *****Tidy up after 5pm. *****Attend function from 6pm.	10% Marked out of 10	Panel of judges from the profession and industry.
End of Semester 2	Second semester's work		10% Graded	Supervisor
5.00 pm, Tue 28 October (Study break)	**Project completion checklist** (back of safety form)	*****Return / forward all things borrowed and all project related hard/soft-ware, files, models, data, reports, etc. *****To be signed off by lab technical staff and supervisor. *****Submit the signed form, to the Mechanical Office, Level 9, by 5pm.	**Project will not be cleared for final grade** unless this signed form is submitted to Mechanical office by this date and time.	

6.0 Project work: general

6.1 Time management, supervision, and record keeping

Since the project counts as 30 points, students are expected to dedicate on average at least 1 to 2 days per week (on average 10 hours per week), and to work steadily at it throughout the year. The commitment should be approximately one-quarter of a full Part IV course; this means that the equivalent of over one day (or 10 hours) per week should be devoted to working on the project. It is strongly advised that students allow a minimum of four hours per week in their personal timetable for project work in laboratories, library, etc; three hours per week for reading, data processing, etc, during evenings and weekends; and an hour for meeting with supervisor.

It should be noted that the quality of the project work is the students responsibility; the supervisor's role is to provide guidance. Where possible the student is advised to make maximum use of the supervisor's advice and expertise. Other staff members may be consulted as well when expertise in other areas is required.

Whatever the nature of the project work, students should keep comprehensive notes and log data in a hard cover journal book. Meetings with supervisors and others on the project should be recorded for later use. Loose sheets of paper are easily lost and are to be avoided.

Record keeping (in a journal book) is an important part of any research or engineering project. Used properly, the record contains a detailed and permanent account of every step of the project, from the initial brainstorming to the final data analysis. Many science and engineering projects require a number of steps and multiple trials. By recording the steps of the procedure, observations, and any questions that arise along the way, one creates a record of the project that documents exactly what was done and when. With a complete record of the project, one can look back at the notes later if a question arises or if it is decided to pursue an alternative project idea based on something that was observed. Similarly, writing down the product design ideas, engineering challenges, and testing data will help keep track of all of the ideas, what was already tried, and how well a particular idea or design performed. Well documented records can result in good quality reports at the end of the project, especially when the project spans over several months, as in a final year undergraduate project.

6.2 Experimental work

To obtain the maximum benefit from a series of experiments, they must be properly designed. How can the experimental program be designed to achieve the experimental objectives in the simplest manner with the minimum number of measurements and the least expense? A successfully designed experiment is a series of organized trials which enables one to obtain the most experimental information with the least amount of effort.

Once a hypothesis, context, and any theoretical models have been considered and the aims and objectives have been clearly identified, the experiment is designed so that it becomes clear (a) what variables are to be measured, (b) how are these to be measured – what tools and instruments will be required, and (c) what methods of data analysis will be employed. It is useful to produce a schematic diagram of the experimental setup. From this exercise it will also be determined whether an existing test rig can be utilised or a new one will need to be designed and built.

Prior to performing the experiments, some important steps include setting up, testing of the rig and apparatus, calibration of instruments, and the conduct of preliminary experiments. There are no "correct" answers in laboratory work. It is inevitable that repeating an experiment will almost certainly not lead to exactly the same result. Therefore, sensible conclusions can be drawn only if the accuracy of the results is known. This may be determined from an error analysis based on repeat experiments (at least five repeats are recommended!) and considering the stated or pre-determined accuracies of instruments that are used.

The full details of design of experiments will be discussed in the Week 6 lecture.

6.3 Laboratory access, safety, technical assistance, manufacturing, and purchasing

Experimental and design-build-test based projects inevitably require the use of laboratories and physical workspaces with tools, instruments, and rigs. Depending on the academic area of the project, each student group / pair will be assigned to a laboratory. The student pair will work with the lead technician or the assigned technician for all their project work requirements from the laboratory or the workshops.

In these areas, safety is paramount and the student is responsible for their own safety as well as the safety of others through the safe use of the space, tools, and equipment. Access to laboratories implies that the student has attended the safety lecture and is aware of all the safety requirements of the faculty and laboratory as discussed

in the safety lecture and with the technical staff. Refer to the faculty Health and Safety Manual (a copy has been placed on Cecil) at:

http://www.engineering.auckland.ac.nz/webdav/site/engineering/shared/about/our-faculty/documents/health-and-safety-manual.pdf.

Other details and up-to-date contacts will be located at:

http://www.engineering.auckland.ac.nz/uoa/home/about/ourfaculty/safety.

Students should sign a declaration in the safety sheet provided and forward it to the lead technician in their assigned laboratory: Jos Geurts – *CACM*, Nick Velychko – *Aerodynamics*, Alan Eaton – *Thermodynamics*, or Ken Snow – *Dynamics & Control/Mechatronics/Manufacturing Systems*. For additional safety requirements see Stephen Elder – *Energy and Fuels Research Unit* (EFRU) and David LePelley – *Twisted Flow Wind Tunnel*. Students are not permitted to work in the laboratories without this declaration, or when technicians are not around, or outside of normal working hours, including at the CACM. Students cannot also work alone, but must do so at least in pairs. When in doubt, the student should seek advice from the lead technician in the laboratory.

It should be noted that the project will not progress far without help from technical staff. Students will find the technicians much more willing to help if they are polite; if they know exactly what they want; if they do not pester them continually about minor things; and if they do not untidy the lab and workspaces.

For the manufacture of test rigs and designs, each group is required to finalise their design in discussion with their supervisor to address academic requirements, and with the technician to address practicalities within the capabilities of the laboratory and workshop, and constraints of cost. It can be helpful to visit the faculty's Technical Services Workshop manager on level 2, with the technician if possible, to obtain feedback before finalising a design. It should be noted that jobs can only be logged with the workshop once it has been discussed with a technician and the supervisor – no exceptions!

During the course of the project, items may need to be purchased from outside of University. In the first instance, this must be approved by the supervisor, upon which the technician should be approached for the correct procedure. Usually a written quote must be obtained and the purchase request will be made by administrative or technical staff in the department through an online system. The whole process may take some time, so proper planning and time management are advised, especially if the item is required urgently. It should be noted that students are strongly discouraged from purchasing with their own funds – it is not only against procurement procedures, but furthermore, reimbursement is extremely difficult and very time consuming for a number of people involved.

To avoid disappointment, students are advised to have their designs finalised and in to the workshop as early as possible.

Further details will be provided during the lecture in Week 5 of Semester 1.

6.4 Computer simulation tools and resources

Some projects will require the use of computer simulation tools and resources, such as for solid dynamics or fluid flow modelling. Others may require simulation of electronic circuits and control systems. To this end, the department has licenses for and access to a range of simulation tools that project students will be welcome to use. Students should consult with their supervisors with regards the simulation tools best suited for their work, and for gaining access to them. Some of the tools available include:

- Ansys (FEA, CFX, FLUENT) – finite element analysis, fluid flow and heat transfer modelling
- Creo, Creo Mechanism toolbox – for CAD, dynamic simulation, of mechanisms, design, analysis
- Labview – for instrumentation, control, and so forth
- LTSpice – for electronic circuit simulation
- Matlab – for data processing, control, and modelling
- Simulink – to model control systems for real time targets

Most of the simulation work could be run on computers available in computer laboratories around the faculty. However, when the modelling and simulation work requires large computer resources because of the nature of the problem being solved (e.g. a full 3D multi-physics simulation of flow around an aircraft), then more powerful computing facilities may be needed. The student should consult with their supervisor with regards to this. If justifiable, then advanced computer cluster facilities may be made available on a case by case basis.

Further details will be provided during the lecture in Week 5 of Semester 1.

6.5 Intellectual property (IP)

The term 'intellectual property' (IP) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images and designs used in commerce. The University acknowledges that students may individually or jointly with their supervisors, create IP through project work.

As part of the enrolment process, the student will have agreed to abide by University policies that help to protect the rights of all of its members, including students, as well as those of the University itself. For full details, students should refer to the *The University of Auckland Intellectual Property Created by Staff and Students Policy* located at https://policies.auckland.ac.nz/policy-display-register/intellectual-property-created-by-staff-and-students-policy.pdf. A copy has been placed on Cecil.

The student is referred to the supervisor or the Projects coordinator for guidance, if necessary.

Further details will be provided during the lecture in Week 8 of Semester 1.

6.6 Project administration and communication

Matters relating to the overall organisation and administration of projects are the responsibility of the Project Coordinator and any questions regarding such matters should be referred to him. In respect of matters relating to specific projects, students should deal directly with their supervisor.

The Project Coordinator will make use of the following tools for project administration and communication: Weekly lectures and seminars from time to time; P4P Online Management System; Cecil; and Email. The student may send an email to the Projects Coordinator in the first instance for any queries or questions that he or she may have; or visit him in his office. If it is deemed necessary, during certain periods of the year, a consultation hour may be allocated in which the Coordinator may be visited with questions.

STUDENTS ARE ADVISED TO READ THEIR EMAILS REGULARLY! It will be very important for students to consistently read their *university emails*, and more so over the last few weeks of the project, i.e. the weeks spanning the report submission, presentations and displays. Last-minute changes and further advice will be made available this way.

7.0 Elements of the year's work

NOTE: A summary of the year's deliverables and their submission procedures is given in section 5, page 3. Each of the elements in the year's work will be also discussed in the project seminar series.

The work during the year as assessed by the supervisor contributes 30% of the final grade. It will be assessed by the supervisor on the basis of the student's diligence, attendance at agreed meetings, progress, standard of experimental or modelling work, planning and organisation, co-operation with others and a mid-year report. 10% of this mark will be awarded at the end of the first semester, 10% for the mid-year report and 10% at the end of the second semester.

7.1 Project safety sheet

Each student must fill out a safety sheet declaring that he/she has viewed the safety video, shown in the second seminar, and has read the Faculty safety manual.

A student will not be permitted to start lab work until this is done.

Submission: The safety sheet (1 per project pair) should be submitted to the technical officer in the assigned laboratory. If there is no assigned lab (for example because the work is purely computational, or it is of multidisciplinary nature), then the safety sheet should be submitted to Ken Snow, Manufacturing Systems lab.

The submission date will be found on pages vi and 3 of this handbook.

7.2 Abstract and planning schedule

Each project group must write a specification for its project in the form of an abstract (1-page) and a planning schedule (1-page) in a single document file. This should be done in consultation with the supervisor; and the final draft should be approved first by the supervisor before submission. *The abstract page should also show the*

title of the project, both partners' names, and the supervisor's name. A suggested format for the *abstract* (maximum 1-page) is as follows (this may vary):

- Paragraph 1 – Introduction to the subject / topic / area (brief)
- Paragraph 2 – What has been done and what needs to be done? What problem is being addressed?
- Paragraph 3 – A statement of the aims and objectives of the research project
- Paragraph 4 – Indication of methodology to be used and what resources will therefore be required.

A *Planning Schedule* – For example a Gantt Chart. There are many ways to create a Gantt chart. For example, Microsoft Project, which is a task-planning program, makes it easy to track and chart project timelines with a built-in Gantt chart view. Another option is to use Excel. Excel does not contain a built-in Gantt chart format; however, one can create a Gantt chart in Excel by customizing the stacked bar chart type.

Submission: The abstract and planning schedule (1 per project pair) should be submitted electronically to the S-drive as follows:

- Filename format: SupervisorSurnameInitial-UPIStudent1-UPIStudent2-APS2014.pdf
  e.g. MaceB-jblo123-jdoe456-APS2014.pdf

- For *Mechanical* students: Copy file to S:\Mech\Submit\MechEng763\APS\

  For *Mechatronics* students: Copy file to S:\Mech\Submit\MechEng762\APS\

The submission date will be found on pages vi and 3 of this handbook.

7.3 Mid-year progress report

IMPORTANT: As with the final report, <u>each individual student's progress report must show that it has been written independently of his/her partner's.</u> Each report will be submitted as a digital file to TurnItIn to check it against all others in the class and those of previous years.

The purpose of the mid year progress report (1 per student) is to present an overview of the project, to report on progress to-date, and outline the work that remains to be completed. It is expected that as the nature of projects vary, so will the structure of reports. It is recommended that students consult their supervisors concerning the organisation and content of their report. Later on, the progress report together with feedback received will form the basis for the final report i.e. the progress report may be developed further into the final report.

The progress report is strictly limited to 10 pages (excluding appendices), and its format should be similar to the final report (see Appendix 1). It may include a concise introduction and background to the project, with clear statements of the aims and objectives. This may be followed by a succinct literature review to demonstrate the students' understanding of the work already carried out by others on the topic, identifying the gaps in knowledge or important issues, and clarifying which aspects of these the research seeks to investigate. If a methodology has been established, or rigs have been designed, or (analytical, computational, or other) models have been developed, then these should also be discussed. The report ought to include a section on 'Progress to date' or 'Project status' in which the students' progress and the status of the project should be given. A reflective statement(s) should be included on the original goals and timeline, and a section on 'Work that remains to be completed' will need to be incorporated. The report should end with a conclusions section and a reference list.

The grading of the progress report will be done by the supervisor, and will largely be on the same basis as for the final report (see Appendix 2).

The format, layout, presentation and style of this report should follow the guidelines given in this document. The fundamentals of writing a report will be covered in the lectures (see section 5).To summarise, this report must:

- Be single-sided on A4 size paper.
- <u>*Not exceed 10 pages including figures.*</u>
- Have the same formatting instructions as for the final report.

The mid-year progress report would typically contain the following elements:

- A **title page** formatted exactly as the sample title page of this document.
- A second page with an **abstract** of no more than 250 words formatted exactly as the sample second page of this document.
- **Introduction**
- **Literature review**

- **Middle sections** with appropriate section headings, including sections describing the work done and the work planned for the second semester (as discussed above!).
- **Conclusions**
- **List of References**

Submission: The individual mid year progress report (referred to as the interim report in the online system) is *to be submitted both in hard copy and electronically* as follows (unless advised otherwise in Semester 1):

- Hard copy: Hand in to the Mechanical Engineering Department office, Level 9, by 5pm.

- Electronic copy: For *Mechanical students*:
  Filename format: ProjectNumber-2014-UPI-mypr.pdf
  e.g. ME04-2014-jblo123-mypr.pdf
  Copy file to S:\Mech\Submit\MechEng763\MYPR\
  For *Mechatronics students*:
  Filename format: ProjectNumber-2014-UPI- mypr.pdf
  e.g. MT34-2014-jblo123- mypr.pdf
  Copy file to S:\Mech\Submit\MechEng762\MYPR\

Project report numbers will be available on Cecil at the end of Semester 1

The submission date will be found on pages vi and 3 of this handbook.

7.4 Final report

7.4.1 General information, important notes, and alerts

An individual report is required from each student. *Each individual student's final report must show that it has been written independently of his/her partner's. Each report will be submitted as a digital file to TurnItIn to check it against all others in the class and those of previous years.*

The report contributes 50% to each student's final grade based on marking by two examiners. Both of the examiners will be academic staff members of the Department of Mechanical Engineering. Neither of these examiners will be the project supervisor. One examiner (the expert assessor) is a member of the academic staff in the research group to which the project belongs; the other is an academic staff member another research group (the non-expert assessor). The criteria used to assess the reports are given in Appendix 2.

It is important to take note of the following with regards the **deadline** for report submission:

- The final report must be submitted online by 5:00 pm on the day of submission.
- This is an absolute deadline.
- The submission date will be found on pages vi and 3 of this handbook.
- Submission details are to be announced (TBA).
- Reports submitted after 5.00 pm will be severely penalised.

With regards the individual nature of the project report and **plagiarism** issues that could arise, the following should be heeded:

- Each individual student's report must show that it has been written independently of his/her partners.
- If the assessors judge that the text and/or structure of project reports show collaboration in terms of a lack of independent writing, analysis, or significant overlap in written material, the student may be severely penalized for plagiarism (copying).
- The university regulations with respect to plagiarism are very strict and the penalties can be very severe, such as being excluded from the course and possible heavy fines.
- *Structure of the report*: It is permissible that the two reports of a project have the same overall gross structure as dictated by the project itself. Beyond this, the reports must show no evidence of collusion.
- *Illustrations*: It may be inevitable that the illustrations in reports of project partners are very similar; this is allowable. If a figure that has been produced by a partner has been used, it should be referenced in the figure's caption.
- To avoid being judged as having collaborated, students are *very strongly advised* not to share digital files or hard copy of written text.

7.4.2 Online submission of the report

Final report is to be submitted digitally. The report together with Appendices should be generated as ONE digital file:

- Filename format: ProjectNumber-2014-UPI-report.pdf
  e.g. MT34-2014-jblo123-report.pdf
- Online submission details will be announced in due course.

The submission date will be found on pages vi and 3 of this handbook.

IMPORTANT NOTE: Reports submitted after 5.00 pm will be severely penalised.

7.4.3 Online submission of the project abstract (one per student)

Abstract of the report is to be submitted digitally. The abstract page (page ii) of the final report should be saved to a separate pdf file, making sure that:

- The title of the project is at the top of the page; and
- Filename format is: ProjectNumber-2014-UPI-abstract.pdf
  e.g. ME07-2014-mjan019-abstract.pdf
- Online submission details will be announced in due course.

The submission date will be found on pages vi and 3 of this handbook. Submit by 5.00 pm on the due date.

7.4.4 Potential problems with timing of final report submission

The students are very strongly advised to organise the word processing resources well ahead of the deadline. Previous experience suggests that at least two weeks, ideally three, are needed for the final preparation of a report of average size. An even longer period of time is likely to result in a very good quality report.

The main problem is usually the amount of time needed for the final formatting. It always takes far longer than imagined.

7.4.5 Format

The font of the text should strictly be 12 point and line spacing should strictly be single. Detailed instructions are given in Appendix 1. *Failure to conform to the specified formatting requirements will be severely penalised.*

The first page inside the cover should be a title page set out as follows. The text box is of size 105mm wide by 50mm high, and is positioned 57mm from the right hand edge of the paper and 72mm from the top edge of the paper. It should give the title of the report, student name and project number. Project report numbers will be available on Cecil at the end of Semester 1.

The second page should give an abstract of no more than 250 words, and again should be formatted exactly as the example second page of this handbook.

7.4.6 Structure of the project report

The fundamentals of writing the final report will be covered in the Project Seminars series (see section 5).

The report is written for a professional engineer and not for a lay reader. The assessor will understand the language of engineering but may not be a specialist in the field covered by the report. It should clearly present the results and conclusions of the work with a critical assessment of their significance. It should include all appropriate supporting material such as descriptions of apparatus and experimental procedures, literature survey, observed results and calculation procedures. The aim should be to present the conclusions and to convince the reader of their validity and relevance.

The report **MUST** be made up of the following skeleton of sections: **Title page; Abstract; Table of Contents; Glossary of Terms; Introduction; Literature review; Middle sections appropriate to your project work; Discussion; Conclusions; Suggestions for future work; Acknowledgements; List of References.**

Abstract
This is a miniaturised version of the whole report. It should be self-contained and from it the reader should know the context of the work (i.e., why it was done); the way it was done (the experimental procedures); the results or its outcome; and the main conclusions. It should be as precise and quantitative as possible and no more than 250 words long.

Glossary of Terms
This gives abbreviations and terms that need to be defined for the assessors. The second assessor (the non-expert assessor) will be a mechanical or mechatronics engineer who may have no specific, detailed knowledge of the area; so some need to be given to the terms that second assessors are likely to need defined.

A two-column format with no visible lines is recommended, with the term in the left hand column and its very brief explanation in the right.

Introduction
This should be an introduction to the project; it should give the background of the work and describe why it is being done, i.e. its context, relevance, significance, history, etc.

Literature Review
This should give an overview of previous and current work in the area, together with the relevant citations. Sub-headings can be used if necessary.

Middle sections relevant to your project work, for example:

> **Experimental Procedure** (or other suitable headings appropriate to the work) gives details of how the investigation was carried out. Enough detail of the equipment and the procedure should be included so that another competent person could repeat exactly what was done, working only from the description.
>
> In the **Results** section, the information that leads to conclusions about the investigation needs to be given. Graphs and tables merely present data; they don't state results. The student needs to ensure that there is a linking, explanatory text, describing the significant features of the results to the readers.

Discussion
The results should be commented upon and interpreted in relation to the objectives of the work and to other people's work.

The use of a **Results and Discussion** section could be considered instead of the two separate sections. It is often a more useful and elegant way of presenting and discussing the results.

Conclusions
This should include a series of the conclusions arising from the material in the Discussion. Each one must be directly and logically drawn from the findings.

> **Examples of poor and effective conclusions:**
> Poor: statements of what was done are NOT conclusions, e.g.
>
> 1. An adjustable furling tail mechanism was manufactured to allow a method of speed control for the wind turbine.
> 2. Experiments were conducted to test the behaviour of the furling tail mechanism.
>
> REAL conclusions: statements of what was concluded from the results, e.g.
>
> 1. The furling system was successful in turning the turbine away from the wind, resulting in a reduction of its rotational speed.
> 2. The tail provided resistance to the drag force experienced by the turbine.

Each conclusion should be made as brief and as quantitative as possible. This section is best written as a bulleted or numbered list, starting with the most important conclusions and working down to the least important. No new material should be presented.

Recommendations (if needed)
This gives a list of the recommendations arising from the Conclusions section.

Suggestions for future work
This describes how the student sees the work might progress in the future. In any project, one sometimes finds that all the intended or planned work is not able to be completed; this section is an opportunity to discuss this professionally.

Acknowledgements
This acknowledges the people who have provided help in the project, most importantly the supervisor, project partner and technical staff. *This section can also be placed after the Table of Contents.*

List of References
This provides a list of all the source material cited in the text. Referencing is one of the most convention-ridden areas of technical documentation, and it is easy to go wrong. An example of text and its corresponding References section is given in *Appendix 3: Guidelines on referencing*. This Appendix also gives information about formatting the more problematic types of source material (e.g. undated material, project reports, magazine articles, standards, etc.).

For further information see Chapter 14: **References** in Silyn-Roberts, H. (2000) **Writing for Science and Engineering: Papers, Presentations and Reports**. Butterworth-Heinemann, Oxford. 288 pages. ISBN: 0-7506-4636-5. ISBN: 9780750646369. On desk copy in Engineering library.

Appendices
These contain the detailed material that would interrupt or distort the main account if not separated out. They are there for the specialist reader and can contain, for example, program listings, raw data, lengthy tables, detailed error analyses, working drawings, etc.

7.4.7 Presentation and style

Appendix 1 should be referred to for instructions about presentation and formatting.

The appearance of a report has a strong effect on its assessment. The student should make sure that the report is readable, pleasing to the eye, and professional in all its aspects.

Illustrations should be used whenever possible and it should be ensured that any text on graphs and their axes is legible. Photographs should not be pixelated, i.e. enlarged beyond their capabilities.

7.4.8 Length

A long report is not necessarily a good report. The student should avoid inflating it; it should be as concise as possible while still meeting the general requirements given above.

The main text of the report must not exceed 25 pages. The student will be penalised if the report is more than 25 pages. The font size (strictly 12 point), line spacing (strictly single), etc, should not be altered to be able to squeeze more in. It will be very noticeable to the assessors and the student will be penalised.

NOTE: the length of a report is measured from the beginning of the Introduction (page 1) to immediately before the start of the References section.

7.4.9 The process of writing the report: suggestions

Most people find that at the end of the year, they have difficulties in staying below the prescribed length of 25 pages. The material therefore needs to be carefully selected. The student may find the following procedure helpful. First, a "brain dump" of key phrases for everything that is to be included, is done. Then decision is made on which section (Background, Results etc.) each should go into. This is followed by listing all the headings and subheadings that are foreseen for the report, and the sections are arranged in a logical order as in a Contents Page. Then this plan is used to write sections of the rough draft. This plan should not be taken as rigid; it may need to be continually altered as the thoughts come into focus during the writing.

Writing process is started by writing the easiest section first. This is usually the section in which the experimental procedures are described. This may be followed by writing the section in which the results are described. The more difficult sections can be left until later when thoughts will have been sharpened by the writing of the easiest parts.

The student should make sure that:

- The accuracy of the data is convincing.
- There is adequate data to support the conclusions.
- The conclusions relate properly to the stated aims.
- The illustrations are clear, and that any text on the graph or axes is legible. Each figure and table must have a number (e.g. Figure 1; Table 1) and a figure title, and a caption (explanation).
- All the statements are clear and cannot be misinterpreted.
- A mechanical or mechatronics engineer with no detailed knowledge of the work can understand it.

Finally the grammar and spelling should be checked; any jargon and informal writing removed, and the sentence and paragraph lengths are varied. As an absolutely final stage, the spell checker should be used and then the report closely read for errors. If the English is weak, it is recommended that someone else be asked to read through the report.

7.4.10 Feedback on your report

The supervisor can give advice on the structure and content of the students report, but will not proof-read or rewrite it. If problems with writing and/or English are detected after marking of the mid-year report, the supervisor may advise the student to contact the Student Learning Centre. There is also a self-access on-line English course (ELE) in the Student Commons.

7.4.11 Large amounts of raw data

One must ensure that the final report is self-contained. If there is a lot of additional information (e.g. raw data code, etc), these should be included as an Appendix. All appendices should be included in the report file.

7.4.12 Confidentiality issues

Any confidentiality issues should be discussed with the supervisor and the organisation. If a project is conducted in co-operation with an outside organisation that requires confidentiality, the organisation should be advised that the reports are placed in the library, thus placing the information in the public domain. The organisation may ask for it to be withheld from the library for a given length of time. This should be communicated to the Projects Coordinator at the earliest.

IMPORTANT note about web sites: No material relevant to the project should be put onto a web site, for reasons of confidentiality.

7.4.13 Subsequent publication

Where the project results in new and publishable discoveries, the student is encouraged to prepare papers jointly with the supervisor for subsequent publication.

7.5 Project conference

Each project group is required to give a conference presentation about their work. Both the presentation and the display should be regarded as professional engineering occasions. Standard of dress together with the quality and type of material presented should reflect this.

7.5.1 Mid-year practice presentations (MYPP)

The dates for the mid year project presentations will be found on pages vi and 3 of this handbook. A detailed schedule will be available at the beginning of semester 2.

These are practice sessions and not graded, but aimed at giving students the opportunity to improve their competency for the final presentations. The following should be noted:

- The MYPP will be a five-minute presentation of individual work (i.e. a strict 10 minutes per project pair, including the accessing of.ppt file from a USB stick). This means one person speaks for the first part, and then the other person speaks for the second.
- Breaking it down into one person doing a bit, then the other, then back to the first, is not allowed.
- This format also applies to the October conference presentation.

- Each group/pair will be videoed during the presentation; and will then immediately have a private discussion with an academic staff member in another room / area, during which the video will be used to give feedback on the competency of their presentation.
- There will be no time for questions at the MYPP.
- This should not be viewed as a 'trial by fire', but as a friendly opportunity for improvement.
- The mid-year project presentations are not assessed; however, if a student/group does not show up, their supervisor will take it into account when their year's work is assessed.
- There is no dress code for the MYPP.
- Part of the assessment form used at the October conference presentations is in Appendix 4.

IMPORTANT: The students should note the following:

- The PowerPoint presentation should be brought on a USB stick.
- The presentation must be driven from the USB stick. It may NOT be loaded into the computer.
- The students own laptop may not be used.
- Movies may not be used in the presentation. At the MYPP, they may not run.
- Each project pair has a strict 10 minutes, including the loading of the file.

7.5.2 Project conference

The project conference will be held in five lecture theatres in the Faculty of Engineering (Rooms 3.401, 3.402, 3.403, 3.404, and 1.401). Each room will have a digital lectern.

The dates for the project conference will be found on pages vi and 3 of this handbook. A detailed schedule will be available in semester 2.

The following should be noted:

- The project conference is regarded as a professional occasion that requires every student to be present. The student should make arrangements not to do outside work for the whole day.
- The PowerPoint files are to be loaded onto the computer desktop as follows: Morning presentations loaded before the start of the first presentation; afternoon sessions loaded during the lunch break.
- Length of time for each project presentation: 10 minutes per student + 5 min for questions = 25 minutes per project pair. No other time combinations are allowed. If there is a single-person project: 20 minutes total.
- A laser pointer will be provided for each session, but not a slide changer.
- The chairperson will give a knock on the desk at 9 minutes to signal that there is one minute left, and again at 10 minutes. At the final knock the student will be expected to finish up within 30 seconds.
- The schedule is tight; therefore changeovers between presentations will need to be smooth.
- The conference schedule will be made available some time before the event.
- Each room will run approximately from 8.40 am to 4.25 pm (depending on room); and there will be three or four sessions per day in each room. This is subject to change.
- Advice from IT: "Students are advised to test their presentations, and in particular, any video clips they want to play in an E-Lectern machine well beforehand. They are not similar to the faculty lab machines in any way in this respect and the video format may need changing to suit".
- Each student will be required to attend any three sessions: sheets will be handed out to be signed at the beginning and end of each session. The three sessions do not need to be in the same room. To minimise the disturbance to the people who are presenting, students will be able to move from one session to another only in the morning and afternoon breaks and at lunchtime.
- Filming during the conference: if a family member or friend is going to film a presentation, he/she needs to ask for permission from the chair of that session.
- A light lunch together with morning and afternoon tea will be provided for staff and students only.
- Dress code: smart casual.

7.5.3 Assessment of the conference presentation

The student will be assessed by two members of the academic staff (criteria, see Appendix 4)

The fundamentals of making a good oral presentation will be covered in the Project Seminars series immediately before the Mid-Year Practice Presentations and before the final presentations.

7.6 Displays day and function night

Each group will prepare a display to explain its project work.

The dates for the project displays will be found on pages vi and 3 of this handbook. A detailed schedule will be available in semester 2.

Each display will be situated in the lab in which the work was done. The session will be open to the general public and invited guests from industry. During the afternoon, guest assessors from industry and the profession will visit each display and discuss the project with the project group. The purpose of the display is to give the students an opportunity to promote their work as it is done in an industrial exhibition. It should be self-explanatory. A panel of practising professional engineers and guests from industry will assess the displays.

There will be a dinner and awards function in the Atrium for all students and staff together with the assessors and invited guests from industry; beginning at 6 pm. Family members cannot be invited to the function. Awards will be presented by the professional groups and organisations.

7.6.1 General guidelines for the display

For further advice, the student is referred to Appendix 5. Important points to note are:

- The displays and setup should be ready by 12.00 pm.
- Displays are located in laboratories and can be static (poster only) or dynamic (poster and equipment).
- Any special requirement should be discussed and arranged with the project supervisor and the laboratory technicians. A need may arise to share some equipment.
- The size of the display poster is A1. They will be printed by the department if submitted in electronic format by the deadline (see page vi or page 3) otherwise the student group will have to bring their own printed poster. Instructions for formatting and submission are given below in the following section.
- Both students involved with a project should be in attendance at their display area and will be required to speak about their project and answer questions.

7.6.2 Formatting and submission of the display poster

Formatting of poster: The students should

- Make sure that the date of the Displays Day (day/month/year) is on the poster.
- Aim for maximum contrast so that the material shows up against any background.
- Use a minimum font of 25 point size for the text of the material (as opposed to that in the title box).
- Think carefully about the colour scheme. Two or three colours should be chosen that work well together. The temptation to go for firework explosions of colour should be avoided. Some useful websites can be found from a Google search for "poster colour schemes".
- Need to be sure that if the logo of an organisation that they are working with is to be included, the logo is not corrupt and will not affect the printing process. This is relatively common with strange logos.
- To see the full-size appearance of the poster, 100% should be selected in the sizing window.

Submission of poster for printing:

- The poster must be submitted as a pdf file.
- The poster file name must have both project partners' UPIs in it, e.g. jdoe456-jblo123-2014.pdf.
- Submission details: see pages vi and 3 of this handbook.
- Posters that miss the deadline will not be printed at departmental expense; the students will need to arrange themselves to get their poster commercially printed. If so: suggested printing firm is: SprintPrint, St Paul's Street, in AUT building. Cost: substantially less than the normal commercial price. Good quality work.
- The posters will be delivered to the relevant labs on the day of the displays. Poster boards will be available in the labs.

7.6.3 Project function and prizes

The Mechanical Department's project function will be held in the Engineering Atrium immediately after the displays. Prizes for the best displays will be presented at the function by various professional and industrial bodies. Details for 2014 will be announced later, however in 2013, the following prizes were awarded:

- Heavy Engineering Research Association Prize
- IPENZ-Auckland Branch Mechanical Engineering Group Prizes (2)
- Vibrations Association of New Zealand Prize

- Composites Association of New Zealand Prize
- Royal Aeronautical Society Prize
- Royal Institute of Naval Architects Prize
- Fisher & Paykel Appliances Prize
- Callaghan Innovation Prize
- Crown RTC Prize
- NextWindow Prize
- KiwiBots Prize
- Hyspecs Prize
- Fantail Group Prize
- Mechatronics Staff Prize

7.7 Project Completion Checklist

The last date for the submission will be found on pages vi and 3 of this handbook.

The Project Completion Checklist is on the back of the safety form that was submitted to the lab in March. It must be signed off by the technical staff member of the assigned lab AND the supervisor. It covers the condition of the equipment that were used, the tidiness in which the laboratory has been left, the disposal of any chemicals, and the clearing of data off the computer(s) that were used; as well as the return and forwarding of all borrowed and project related material and files to the supervisor.

The student should ensure (1) the technician; and (2) the supervisor, have BOTH signed it off and then submit it to the *Mechanical Engineering Department Office, Level 9 by 5.00 pm, on the due date.*

NOTE: <u>The student / project will not be cleared for the final grade</u> unless this signed form is submitted to the Mechanical office by this date.

Appendix 1: Formatting instructions for the final project report

Note:
Severe penalties will be imposed on reports that do not conform to the specified length and formatting requirements of the reports.

These notes summarise the instructions for formatting your Part 4 Project Report. Please refer to the Project Co-ordinator (Rajnish Sharma) for further explanations if you have any doubts. This will also be covered in the project seminars, together with guidelines for using the formatting options in MS Word.

A1.1 Font, spacing, margins, justification, page numbering, report length

The main body of the report should be single-sided on A4 (210×297mm) size paper. It should **strictly be single spaced** and in Times New Roman font. **The font size should strictly be 12 point**. The printing area should start 20mm from the top of the page with a right hand margin of 20mm, and a left hand binding margin of 30mm.

All new paragraphs should be preceded by a single line space.

Text should be justified.

Page numbers should be at the bottom right of each page.

The body of the report, i.e. from the beginning of the Introduction to immediately before the start of the List of References section, should be **no more than 25 pages** in length.

Make sure that you check your formatting after printing. Different printers can often make unexpected changes to your layout.

A1.2 Headings

The main body should have no more than three levels of headings (e.g. 2., 2.1 and 2.1.1).

A1.3 Use of references

References should be quoted in the text either by numbers in square brackets (e.g. [1] or superscripted).
They should be numbered in the sequence of their first appearance. This unique number must be used each time this source is cited in your report.
References should be listed together at the end of the report in the List of References section, in the numerical sequence in which they appear in the report.
Appendix 3 gives further guidance on referencing.

A1.4 Use of SI units

The International System of Units (SI) **MUST** be used throughout your reports. **If you do not do this, your reports will be marked down.**
There are a number of online reference sources. Recommended: National Institute of Standards and Technology. International System of Units (SI): http://physics.nist.gov/cuu/Units/units.html

A1.5 Abbreviations

Any abbreviations should be spelled out in the first instance of use and followed by the acronym in brackets, e.g. Computer-Aided Design (CAD). Thereafter, the acronym alone will be sufficient.
These terms and their abbreviations must be listed in the Glossary of Terms.

A1.6 Mathematical symbols and equations

Mathematical symbols using alphabetical letters should be in italic, while those using Greek letters remain in regular font.

Equations should be numbered consecutively throughout the report. Equations should be centred with the equation numbers in round brackets and right justified. Leave about one line space both above and below the equation. For instance:

$$y = ax + \cos x + \beta \tag{1}$$

A1.7 Illustrations: guidelines

All symbols and text in illustrations should be of a size that is clearly legible.

All illustrations (figures and tables) should be numbered consecutively in the order of their first appearance.

One numbering sequence should be used for figures (graphs, photographs, line drawings, etc) and a second for tables, thus:

Figure 1, Figure 2, Figure 3….
Table 1, Table 2, Table 3…

Each illustration **MUST** have a figure or table number and a title. Conventions state that the figure number and title are centred and placed **below** a figure and **above** a table:

Each illustration **MUST** be referred to by its figure or table number at an appropriate place in the text (for example, Figure 3 shows …; …as shown in Table 2).

Example of number and title for a figure:

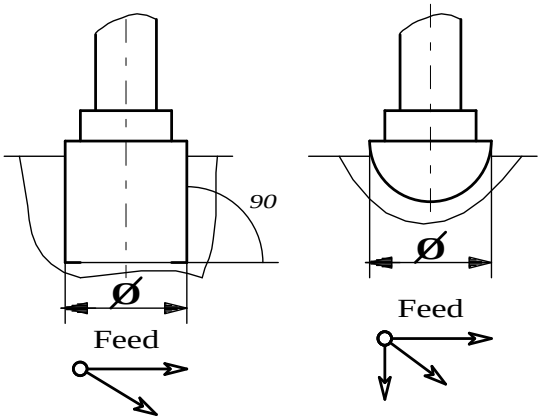

Figure 1 Milling cutters and their feed directions

Example of number and title for a table:

Table 1 Maximum tensile and compressive stresses of the wing bones of Pteranodon ingens

Bone	**Tensile stress σ_t (MPa)**	**Compressive stress σ_c (MPa)**
Metacarpal	68	73
1st phalanx	70	75
2nd phalanx	113	123
3rd phalanx	215	230
4th phalanx	146	174

Appendix 2: Criteria for the assessment of the final project report

This is a list of the criteria used by the assessors of the final project report:

Presentation

English

Grammar - Sentence structure; style; case; tense
Spelling
Readability - Does it read well? Is it unambiguous?

Structure

General – Does the order prepare the reader and set the objectives?
Flow /Clarity – Is the material logically presented? Can you find points easily ?
Format /Layout - Are the headings, Table of Contents etc, logical?
Abstract – Does the Abstract explain context of the work, methods, results and main conclusion(s)?
Diagrams – Is the quality of the diagrams acceptable?
Are the diagrams necessary? Are there too few diagrams ?
Have they been properly acknowledged, if copied ?
References - Are they correctly cited ? Are they complete?
Bibliography – Are the sources correctly cited?
Appendices - Are they needed ? Are they referred to in the main text, etc ?

Technical Content

Literature Review

- Is the quantity and quality of the references sufficient?
- Is the background to the report described and is this material developed?
- Has the basic research been done? (Bear in mind intended readership)

Depth of study

- Has a suitable level of research been achieved? This should go beyond the level of undergraduate BE papers in subject area.
- Does the theory adequately describe the test data?

Quality of the Analysis

- Is this report a professional piece of work?

(It is useful to ask if someone else wanted to extend the work described in this report, could they repeat this study on the basis of the report ?)

Technical Synthesis

Discussion - Is the explanation of the results sensible and well founded?
Conclusions - Do they meet the objectives of the project?

Appendix 3: Guidelines on referencing

Example: system of referencing for Final Year Projects. Text and corresponding List of References

Comments

The recent upsurge of interest in the mechanical efficiency of medieval hurling devices has resulted in their use as subjects for student construction projects in engineering [1]. There is also a wealth of web-based material: for instance, graphics and information [2], applications such as desktop models [3], and computer simulations of a trebuchet [4, 5].

-A second reference to Source Number 1. Note that it is not assigned a new number
-Author mentioned in text
-Three references in a series, separated by commas

Used in ancient times to hurl everything from rocks to plague-ridden carcasses of horses [5] and, in a modern four-storey-high reconstruction, dead pigs, Hillman cars and pianos [1], the trebuchet relied on the potential energy of a raised weight. Its mechanical efficiency has been compared unfavourably by Gordon [6] with that of the palintonon, the Greek hurling device, which could hurl 40 kg stone spheres over 400 metres [7, 8, 9]. This device incorporated huge twisted skeins of tendon, a biomaterial that can be extended reversibly to strains of about 4% [10]. The palintonon utilised the principle of stored elastic strain energy – the fact that when a material is unloaded after it has been deformed, it returns to its undeformed state due to the release of stored energy [11]. The motion of the palintonon [12] and that of its Roman equivalent, the onager [13], has been analysed by use of the energy principle applied to the finite torsion of elastic cylinders.

-Precise placing of references in the text; one referring to the palintonon, and another to the onager

List of References

1: Article in journal, no volume number

1 O'Connor, L. (1994) Building a better trebuchet. *Mechanical Engineering*, January, 66–69.

2, 3 4: Electronic sources, each with a cited author

2 Miners, R. *The Grey Company Trebuchet Page.* Retrieved January 21, 2012 from http://members.iinet.net.au/~rmine/gctrebs.html

3 Toms, R. *Ron L Toms' Products and Services.*Retrieved February 15, 2012 from http://www.rlt.com/

4 Siano, D. *The algorithmic beauty of the trebuchet.* Retrieved January 14, 2012 from http://members.home.net/dimona/

5: Electronic source, with no cited author

5 *The Virtual Trebuchet.* Retrieved February 1, 2012 from http://www.stud.ifi.uio.no/~oddharry/blide/vtreb.html

6: Editorial in journal

6 O'Leary, J. (1994) Reversing the siege mentality. *Mechanical Engineering*, January, 4.

7: Book. Note publisher, place of publication, and relevant page number(s)

7 Gordon, J.E. (1978) *Structures or Why Things Don't Fall Down*. Penguin, Harmondsworth, pp 78–89.

8: Article in magazine with volume number in bold face

8 Soedel, W. and Foley, V. (1979) Ancient catapults. *Scientific American*, **240**, 150–160,

9: Chapter in book.

9 Hacker, B.C. (1968) 'Greek catapults and catapult technology: science, technology and war in the ancient world.' In: *Technology and Culture*, **9**, No. 1, pp 34–50.

10: Book.

10 Marsden, E.W. (1969) *Greek and Roman Artillery*. Clarendon Press, Oxford. Pages 86–98.

11: Book

11 Wainwright, S.A., Biggs, W.D., Currey, J.D. and Gosline, J.M. (1992) *Mechanical Design in Organisms*. Second edition. Longman, Harlow. Page 83.

12: Book.

12 Benham, P.P., Crawford, R.J. and Armstrong, C.G. (1996) *Mechanics of Engineering Materials.* Second edition. Longman, Harlow. Page 67.

13: Paper in journal

13 Hart, V.G. (1982) The law of the Greek catapult. *Bull. Inst. Math. Appl.*, **18**, 58–68.

14: Paper in journal

14 Hart, V.G. and Lewis, M.J.T. (1986) Mechanics of the onager. *J. Eng. Math.*, **20**, 345–365.

How to reference problematic sources

Note: If the author is not stated

Describe the source as fully as possible, in the style of the relevant examples below. The order of the items cited is:

- The title of the document should be cited first
- Date (when possible)
- The organisation/institution that produced the document.
- Any identifying number, such as designation code, or contract number.

For citation in the text: use the first few words of the title.

Thesis	Johnson, C.E. (2005) A Study of Residual Stresses in Titanium Metal Matrix Composites. PhD Thesis, University of Middletown.
Student report (including your project partner's report)	Tsoi, T.S. 2006 Development of a modular planar positioning platform and crystal unit reorientation system. Part IV project report, 2006-MT25.
Lecture material	If the writer's name is stated: Carter, R. (2012) Robotics. Lecture handout, Engineering and Society, The University of Middletown.. If the writer is unknown: Wetlands (2012). Lecture handout, Conservation Ecology**,** The University of Middletown.
Newspaper article	Author is known: Nicholson-Lord, D. (1995) Does work make you stupid? Independent on Sunday, 29 January, p 21. Author is unknown: Could alcohol be good for your liver? The Week, 13 November 1999.
Magazine article	Author is known: Hibbert, L. (2007) Natural products. Professional Engineering, 21 November, 20-21. Author is unknown: Shades of green (1998). Consumer, Number 344, 21-24.
Technical report	Hilley, M.E. Ed. (1971) Residual Stress Measurement by X-Ray Diffraction. SAE Information Report J784a, Society of Automotive Engineers, New York.
Government and legal documents • The first element of information is the government department, committee or body. The last two may also be referenced by the name of the chairperson. • Include the complete title.	CORINAIR Working Group on Emission Factors for Calculating 1990 Emissions from Road Traffic, 1 (1993). Commission of the European Committees (Office for Official Publications, Luxembourg).
Section of an Act of Parliament	Risk assessment and notification requirements (1990) Environment Protection Act 1990 (c. 43), Part VI - Genetically Modified Organisms, Section 108. Act of Parliament, United Kingdom. Her Majesty's Stationery Office, London.

Report by a professional body	Recycling Household Waste - The Way Ahead (1991). Association of Municipal Engineers, The Institution of Civil Engineers, London.
Engineering codes	Building Code Requirements for Reinforced Concrete and Commentary (1989). ACI Committee 318, American Concrete Institute, Detroit.
Standard specification	Standard Specification for Urea-Formaldehyde Molding Compounds (1994). Designation D705-94. , American Society for the Testing of Materials, Annual Book of ASTM Standards 1999. **08.01** Plastics (I), 92-93.
Standard test method	Standard Test Methods for Thermoplastic Insulations and Jackets for Wire and Cable (1996). Designation D2633-96. American Society for the Testing of Materials, Annual Book of ASTM Standards, 1998, **10.02** Electrical Insulation (II), 25-38.
Standard practice	Standard Practice for Algal Growth Potential Testing with Selenastrum capricornutum (1993). Designation D-3978-80 (Reapproved 1993). American Society for the Testing of Materials, Annual Book of ASTM Standards 1997, **11.05**, Biological Effects and Environmental Fate; Biotechnology; Pesticides, 29-33.
Patent	Kuhn, K. J., Wehner, W., Zinke, H. (2000) Stabilizer combination for chlorine-containing polymers. US Patent number 6 013 703.
Map	Swansea and The Gower (1974) Ordnance Survey Sheet 159, 1:50 000, First Series. Director General of the Ordnance Survey, Southampton.
Consulting report Include **name of consulting firm**, **contract number** and **for whom** the report was prepared**.**	Wylie Stream Intake Feasibility Report (1997). James Consultants Ltd., Contract TKA 99/136. Prepared for Middletown Central Electricity Generation.
Undated documents Put (undated) where the date is normally placed.	Predicting Traffic Accidents from Roadway Elements on Urban Extensions of State Highways. (undated). Bulletin 208, New Zealand Highway Research Board.
Fact/data sheet: no author, undated	Twintex TPP fact sheet (undated). Verdex International S.A.
Formal interview	Reidy, H. (2012) In interview, April 3.
Someone has told you something useful	Either in the Acknowledgements or As a pers. com. Example in List of References: 4. A.J. Brown, pers. com.

Appendix 4: Assessment of presentations, Mid-year and Conference

- Below is part of the assessment sheet used at the October conference presentations.
- This will NOT be used at the MYPP, but your assessor may refer to a number of these points during your feedback session.

As indicator only: Assessment sheet used for the conference presentations

Structure (introductory remarks, key points, logically presented story, concluding remarks)		
Rambling; illogical.	0 1 2 3 4 5	Well-structured; understandable.
Content		
Irrelevant; Uninteresting; too much/too little detail.	0 1 2 3 4 5	Relevant; interesting; right amount of detail.
Quality of visual material		
Poorly conceived and prepared.	0 1 2 3 4 5	Well conceived; well prepared.
Integration of visual material with the talk		
Does not support the spoken material.	0 1 2 3 4 5	Well integrated.
Vocabulary (spoken and written) and fluency		
Inappropriate vocabulary; non-fluent.	0 1 2 3 4 5	Appropriate vocabulary; fluent.
Professionalism of the presentation (commitment, involvement, proper use of notes, voice level and stance)		
Poor.	0 1 2 3 4 5	Excellent.
Technical competency of the project work		
Technically incorrect and/or simple.	0 1 2 3 4 5	Technically correct and challenging.

As indication only: won't be used in MYPP

Appendix 5: Advice about Project Displays Day

1. **Poster collection**
Your posters will be waiting on the displays day in the lab in which you are displaying your project.

2. **The judging rounds**

- There are two judging rounds: the first one is to assess the displays; the second one to decide on the prizes.
- The first round will start any time after 12.30. You need to be fully set up by 12.00 at the latest.

- **First round of judging:** There will be about eight teams of judges, each one accompanied by an academic member of staff . The team of judges will spend about 10 minutes talking to the two students and looking at their display.

- To get you to speak, the judges are likely to do one of two things (or both): Ask you to tell them about it, or ask you questions. Be prepared for either.

- IMPORTANT: the judges may have no specialist knowledge of your area. You need to remember this when explaining your project to them.

- **Second round of judging: T**he second judging round will decide the prizes. The possible prizewinners will have been identified in the first round, and only these projects will be visited in the second round. On this round, the judges will be from the professional institution in that area of knowledge, i.e. they'll have specialist knowledge and are therefore likely to ask more searching questions.

3. **Be prepared for visits from staff from other departments in the Faculty and the public.**
Faculty staff have been invited to visit you from 1.00 pm onwards. The publicity person will also visit during that time. The public (your family, etc) can visit between 3.00 and 5.00 pm; during this time the laboratories can be very crowded indeed.

4. **Name tags**
Each student, staff member, judge and guest needs to have a name tag. These need to be the official ones prepared by the department. You can collect these in the morning of the displays day from the technicians in your laboratory.

5. **Assessment**
You'll be assessed on the poster, the technical content, and the professionalism of the presentation. Total of 10 points, final % of project is 10%.

6. **The project dinner**
Please note: We regret that no partners, family, etc can attend the dinner. The guests will consist of only the students, staff, invited guests from industry and the judges.

The dinner starts with drinks and nibbles at 6.00 pm, with the dinner starting at 6.30. The prizegiving ceremony will take place between the first and second courses.

7. **Drinks and drinks tickets**
You may not bring your own liquor to the dinner.
In your name tag are two drinks tickets which can be used for either wine or beer before the meal. Wine, juice and water will be on each table during the dinner.

Appendix 6: Final Year Projects 2014 Planner

Final Year Projects 2014 PLANNER

Department of Mechanical Engineering

MECHENG 762 and MECHENG 763

SEM1: TUESDAYS 2.00 – 3.00 pm Conference Centre Lecture Theatre/423-342
SEM2: MONDAYS 2.00 – 3.00 pm Eng3404/403-404

Cal Wk	Sem Wk	Month	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
10	1	MARCH	3 Semester 1 begins	4 Intro Lecture	5	6	7 PREG Deadline
11	2		10	11 Safety Lecture	12	13	14
12	3		17	18 LLS Lecture	19	20 PSS / APS Due	21
13	4		24	25 LRW Lecture	26	27	28
14	5	APRIL	31	1 MCP Lecture	2	3	4
15	6		7	8 DOE Lecture	9	10	11
16			14 Mid-Sem Break	15	16	17	18 Good Friday
17			21 Easter Monday	22	23	24	25 Anzac Day
18	7		28	29 STR Lecture	30	1	2
19	8	MAY	5	6 IP Lecture	7	8	9
20	9		12	13 MYPRW	14	15	16
21	10		19	20 WPD Lecture	21	22	23
22	11		26	27 DPP Lecture (TBC)	28	29	30
23	12	JUNE	2 Queen's birthday	3	4	5	6 Lectures End
24			9 Study break	10	11	12 Exams begin	13
25			16	17	18	19	20
26			23	24	25	26	27
27		JULY	30 Semester 1 Ends	1	2	3	4
28			7	8 MYPR Due	9	10	11
29			14	15	16	17	18
30	1	Semester 2 begins	21 MYPP Lecture	22	23	24	25
31	2	AUGUST	28 MYPP Clinic	29	30 MYPP	31	1
32	3		4 MYPP Consultation	5 MYPP	6 MYPP	7	8
33	4		11 PRW Lecture 1	12	13	14	15
34	5		18 PRW Lecture 2	19	20	21	22
35	6		25 PCP Lecture	26	27	28	29
36		SEPTEMBER	1 Mid-sem break	2	3	4	5
37			8	9	10	11	12
38	7		15 PRW Clinic 1	16	17	18	19
39	8		22 PRW Clinic 2	23	24 REPORT Due	25 ABSTRACT Due	26
40	9	OCTOBER	29 SYSTEMS WEEK	30 SYSTEMS WEEK	1 SYSTEMS WEEK	2 SYSTEMS WEEK	3 SYSTEMS WEEK
41	10		6 CPD Info session	7	8	9	10
42	11		13	14 POSTER Due (*for printing by Dept*)	15	16	SATURDAY 18th : Project Conference
43	12		20 PWU Info session	21	22	23 Displays, Dinner, Prizegiving	24 Lectures end
44			27 Study Break / Labour Day	28 PCC Due	29	30 Exams begin	31
45		NOVEMBER	3	4	5	6	7
46			10	11	12	13	14
47			17 Semester 2 ends	18	19	20	21

APS = Abstract and planning schedule
CPD = Conference presentation and displays
DOE = Design of experiments
DPP = Data processing and presentation
LLS = Library and literature search
LRW = Literature review write-up
MCP = Manufacturing capabilities and procedures
MYPP = Mid year project presentation
MYPRW = Mid year progress report write-up
PCC = Project completion checklist
PCP = Project conference presentation
PREG = Project registration
PRW = Project report write-up
PSS = Project safety sheet
PWU = Project wrap-up
STR = Simulation tools and resources
WPD = Word processing and documenting