2021 Mechanical and Mechatronics FYP Handbook

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

Version History

1. October 2016 – Major Revision from 2015/16 Document
2. January 2017 – Track changes edit from 2017 leadership
3. October 2017 – Clarification about DIY FYP added
4. February 2018 – Minor revision to clean and clarify
5. January 2019 – Minor Updates
6. July 2019 – Further minor updates
7. January 2020 – General annual update
8. January 2021 – General annual update

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Introduction

Welcome to the Final Year Project (FYP). As the name implies, welcome to your Final Year of studies for your degree. It is assumed that you have successfully completed at least 210 units of study (single degree students) before entering this course. *Unless you have exceptional circumstances, and approval, you should not be here unless you meet this fundamental criterion!*

This project course is intended to allow you to consolidate all of your learning across the duration of your program to date, into a single point of focus. Through your project you have the opportunity to consolidate many of the engineering program graduate attributes and demonstrate your readiness for your career as a professional engineer.

Educational Rationale for FYP

The following statements illustrate a common view of the goals of the FYP from across the engineering providers:

> *The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies, and vary from year to year. The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres.*
>
> - **The University of Newcastle**
>
> *Engineers Australia accreditation guidelines require Bachelor of Engineering and Bachelor of Engineering Technology students to show that they are capable of 'personally conducting and managing an engineering project to achieve a substantial outcome to professional standards'. At CQ University the Final Year Engineering Project (FYEP) is an individual project.*
>
> - **Central Queensland University**
>
> *This is a diverse subject like no other you have tackled before. You will be required to show significant self-motivation and initiative, and bring together all your wealth of knowledge gained over the past years in electrical engineering. I'm sure you'll enjoy the challenge! Most students find it to be one of the most-rewarding experiences of their time at The University. I hope you do too!*
>
> - **The University of Sydney**

All Bachelor of Engineering programs at Newcastle University are 'Embedded Honours' programs. This means that from your first course at this University, you have been directed, encouraged and expected to undertake self-directed research. In the early parts of your degree, you may have been asked to complete an assignment where insufficient information was provided in the notes, for example. By the final year of your degree, you should be able to identify where you have insufficient knowledge, and then locate additional information from a variety of sources.

The final year project is where you demonstrate your capacity for independent 'lifelong' learning amongst your other professional skills. We believe that the FYP offers many students the opportunity to consolidate many stage 1 Engineers Australia competencies at a graduate level. Naturally, all projects might not address all graduate attributes, but many will. Please do not confuse Program Learning Outcomes/graduate attributes with the Course Learning Outcomes which are the primary focus and need to be demonstrated.

By its inherent nature, research projects and the span of projects within the Final Year Projects all lead to different reporting styles and requirements. As such a single template is not possible to create or provide. There are some suggested 'essential items' listed further in this document that must be complied with. You are encouraged to work consistently with your supervisor and follow their suggestions for your report – whilst maintaining the 'essential elements' described in this document.

Getting Started

Finding a supervisor and project is YOUR responsibility, and you should start looking as soon as possible.

Finding a Supervisor and Project

If you are working with a company, they can often sponsor a suitable FYP. If you are in this situation and your employer has a potential project that they would anticipate needing approx. 400 hours of a graduate engineers time, this might be a suitable FYP topic.

To suggest an **industry sponsored** project, draft a page describing the projects aims, method of approach and resource implications – e.g. I will need an antimatter generator and flux capacitor - and then consult with a potential academic supervisor. Be mindful with industrial projects that have 'essential items soon to be bought', and 'test facilities will be ready by' as these can often end in tears.

The vast majority of students will undertake **academic projects**. Throughout your program at the University you will have had contact with most, if not all, academics in the discipline. Each member of our staff have areas of interest which spawn their list of FYP's. A partial list of topics might be made available on the notice board outside of ES409, or through the FYP Blackboard course.

Irrespective of formally defined project titles, several academics will be able to formulate a project around their needs and your skills/interests.

Take stock of your skills and interests before you start seeking projects. Whilst the FYP is intended to stretch you, it is silly to take a project topic just because it is there, particularly if in an area you have little passion or capacity.

You should make a point of knocking on doors before the start of semester and seeing what each academic has on offer! Sending a random email is unlikely to solicit a good response.

DIY – FYP Topic. CAUTION NEEDED: You are welcome to pitch your own FYP topic to a sympathetic supervisor of your choice. If they accept you as a student – all good. There is potential to claim back a very small amount of expenditure for a DIY-FYP, but only where these items have residual value to the discipline (IE we keep them, and can use them). Your DIY-FYP's final outcome is unlikely to be anything more than a proof of concept and you should not anticipate the time and $ investment from the discipline to make a commercially viable, or long term usable product. Do not expect every DIY FYP to be accepted/approved. What might sound good and substantial to you, might be rather trivial and let you down if we allow you to pursue it.

Topics from other Faculties
Physics and other UoN areas, have often provided/supervised Mechanical and Mechatronics FYP projects. These opportunities exist and selected students may wish to pursue these. Undertaking these projects will need approval by the

MECH4841A/ENGG4801A course co-ordinator but otherwise are a fine option.

Choose a project that you believe aligns with your interests and skills – at least to an extent. Choosing a 'design' project when you have no aptitude or interest for design is not a sensible decision. - It will simply lead to frustration and de-motivation in the project. Ensure the start point for the project is 'within reach' – there is no point selecting a highly complex project that you can never commence. Likewise, having a project that you can 'complete' in 200 hours, denies you the capacity to demonstrate just how good you can be, and potentially returns a lower that desired grade.

Budget You should discuss the financial opportunities surrounding your project at the commencement phase. Some research inspired projects might enable significant budget outlay, others might not.

Role of the Supervisor

The role of your supervisor is to provide guidance throughout the project to help you optimise your educational growth and the project outcomes. Every supervisor will have a different style of managing projects and students. At the least, you should expect **to be able to** book a time with your supervisor to discuss directions, issues and seek their guidance in navigating the obstacles that are inherent at any University or large workplace.

Supervisors are generally happy to review draft version of your reports, but do not expect an editorial service, or for them to read a draft more than once. Do not expect your supervisor to read your draft when it is submitted the week it is due!

Having Professor 'X' as your supervisor does not mean you should not utilise the other academic resources available in the discipline. By this, if you need specialist direction in an area that your supervisor is not well versed, ask someone else. I would expect all supervisors to direct you to other colleagues if they are not 100% comfortable with the questions being asked. For example, if you are an F-SAE student asking me (McBride) about the metallurgy of Cr-Mo steel with a low hydrogen weld and the need for pre-heat – I will first direct you to do some research on that specific topic, and then to consult Dr Cuskelly/A/Prof Feidler once you know enough to ask a sensible question.

Again, this is YOUR project. It is not automatically your supervisors project that you are working on, but your method to demonstrate you are ready to be awarded an engineering degree and enter the profession. Whilst it may be that your project forms part of your supervisors own research portfolio and thus they have a strong interest in the outcomes, it is not their job to complete or drive your project.

Workload

The final year project is a rewarding aspect of any engineering degree, but is highly dependent on your attitude and input. Unlike all other courses, there are few due dates, usually at the end of the respective semesters. This means that it is often possible that you will end up prioritising other assignments (etc) to the detriment of your Final Year Project.

Unless you are extremely diligent and self-motivated this can, and has, led to some students failing their FYP through a simple lack of progress. Whilst simple 'time on task' will not ensure a passing grade, a lack of time on task will result in a failing grade.

There are three keys to obtaining a good outcome in your Final Year Project:

1. Ensure you are active EVERY WEEK of your FYP (*Use Harvest or other time trackers)
2. Use the mid-semester and mid-year breaks to get ahead.
3. Choose your project to align with your interests and skills.

* HARVEST is one of many time trackers that are available. There is a free personal version available, and we have a short training video about its use for your FYP. However, you are free to use any time tracker (including pen and paper), but a 'time log' is required in your submissions that demonstrates your time investment over the period of the project on a continuous basis.

The project course is very sparse on formal contact. In place of conventional lectures, weekly, one hour seminars are run in the FYP A course. Not all sessions will be utilised, but a running schedule will be uploaded to blackboard and updated as necessary. Given the COVID19 implication in higher education, many sessions from 2020 were recorded and will be provided 'up front' and engagement with either these or the 'Face to Face' sessions should be considered as a minimum mandatory requirement for the course.

Core seminars include presentations on local WHS requires, library research skills, oral presentation and report writing skills, optional sessions on legal issues in engineering, employability, will run depending on availability of specialists. You are EXPECTED to attend in person the seminars presented by external presentors. It is poor form to have an external person give their time to prepare and present a seminar and only have 5 students attend!

You should expect to make time to meet regularly with your supervisor. Each supervisor will have a different style. Some with want weekly meetings with all or individual students, and some will not. Anecdotal evidence strongly suggests that your willingness to regularly meet with your supervisor correlates to your final grade. This is largely because they can help stop you falling down a rabbit hole and straying from the topic!

As a minimum, you should expect your project to consume around 360hours of defendable work. General chat with your mates, over pizza, whilst watching the TV does not automatically count as defendable time. It may be very therapeutic to do this, but should not form part of your defense in the case your project does not meet the necessary standards for passing. Typically, 5% -10% of project students fail their project in the first attempt! – DON'T BE ONE OF THEM.

Completion of 450 hours of work does not = a passing grade.

Project Deliverables and Timeline

Project deliverables consist of a number of mandatory, formative (pass/fail) assessments, and the final report (100% of final grade).

2020 – MANDATORY Time log - This replaces the Weekly Journal Entries, though the WJE are still a very useful tool for you!

In consultancy and many other areas, your time is a billable commodity and needs to be tracked. This requirement is for students to log their hours to project sub sections (Lit review, design, testing…) and that a graphic or other record is included in your bound thesis. **Omission of this element may result in project failure.**

Whilst simple aggregation of hours will not result is a passing grade, a lack of hours will most likely result in a fail grade.

~~Weekly Journal Entries~~

~~I strongly suggest you keep a weekly reflection of your FYP progress. A simple proforma is included below as a basis for your reflection. These are incredibly useful when you come to write your final report as they serve to remind you both of your achievements and adversity overcome.~~

Name: Semester/Week: Over the past week, I have achieved/commenced/completed/resolved: This week I failed to: Challenges - I need help with: Over the next week I will (i.e. my plan of attack is):

Template 1: FYP Journal Entry

The use of the reflective journal is no longer compulsory for inclusion in your report, those students that have used this tool have reported it as incredibly valuable.

Week 3 Report (Formative Assessment) – Due Week 3 of Part A

By the end of week 2, you should be well into your project. At this stage, you should have a clear idea of what the expected deliverables of your project are, and how you can achieve these. To aid you in getting this together, you MUST complete ~~the pro- forma supplied in the electronic resource pack (ZIP File in Blackboard)~~ **~~and submit it to~~** ~~the designated place on Blackboard.~~ a Microsoft Form to capture this information. Separate instructions will be posted in Blackboard.

This 'document' below should be used in consultation with your supervisor to ensure initial project alignment.

Name:
Project Title:
Project Supervisor:
Aims/Objectives of my project area:

To achieve this, I will need: (things to be built, things to be bought, installed etc)

So far, I have:

I am planning for a grade of [FF,P,C,D,HD,HD+]:
To Justify this grade, I need to achieve:

~~Template 2: Week 3 Report NO LONGER NEEDING UPLOAD~~

Week 7 Seminar abstract (Formative Assessment) – *Part A* Due Week 7: Using the Blackboard supplied template, retaining all the styles etc, please complete and submit your seminar abstract back to Blackboard by the due date. These abstracts are collated into the conference schedule and serve to inform the audience (your peers), if your talk is worth attending.

FirstName, LastLame

Project Title

Supervisor
Brief Description
Filename for submission:- lastname_sem1_abstract.docx. (eg McBride_sem1_abstract)

Template 3: FYP A Seminar Abstract – Please use the electronic version from the Blackboard site

For the above brief description, the following questions should be considered.

1. **Introduction. In one sentence, what's the topic?** specifically

2. **State the problem you tackle**. What's the key research question? Again, in one sentence.
3. **Summarize (in one sentence) why nobody else has adequately answered the research question yet**.
4. **Explain, in one sentence, how you tackled the research question.**
5. **In one sentence, how did you go about doing the research that follows from your big idea**.
6. **As a single sentence, what's the key impact of your research?**

Part A Report (Formative Assessment) – Due Week 12 of Part A

Your Part A report is a progress report. The intent of the Part A report is to provide you with a chance to reflect on your progress to date, and formalise your plans for the second semester of your work. Your report aims to convey this to your supervisor to ensure you are both in agreement with your proposed direction.

In the creation of your Part A document, you should aim to report the work that has been completed to date, which should (MUST) reflect 120+ hours of effort. This should be a large part of the final background, literature review and the designs for any test equipment you need. As this part A report should be the basis of your part B report, it is worth considering to create the remaining skeleton for your final report. This should help you think about the sections you need to still work on over the next semester. There is no compulsion to retain the headings and sections that you place into the part A report, but these should still add value to your report creation process. Overall, to report 120 hours of work a report of 20 pages of text (plus images, references etc) should be anticipated. Reports containing less than 10 pages of text will need to be heavily defended by the student as to why this should not constitute exclusion from the Part B.

The Part A report is a chance for you to practice your writing skills, and realise the effort involved in producing a lengthy, professional report.

You should aim to utilise the Part A report to get feedback on your writing style that you will use for your Part B report. IT IS THE STUDENTS RESPONSIBILITY TO BOOK TIME WITH YOUR SUPERVISOR TO GET THIS PERSONALISED FEEDBACK.

This is a compulsory, formative assessment, and does not contribute to your final grade. A failure to submit, and/or a trivial attempt may result in an administrative withdrawal from Part B being applied. IE you will not be enabled to proceed further with the project.

You may consult the following checklist to help you ensure your report meets specification.

One copy (consult your supervisor as to whether they require additional) of a bound, A4 report with a clear cover and card back that contains:

- Part A cover page (available on Blackboard).
- Abstract
- Progress Report***
- Bibliography/Reference List

*** The progress report must demonstrate appropriate engagement with project commensurate with the work that should have been completed at this point in the project. IE this report should be reflective of 120-140 hours of completed work. The report should attempt to clarify the work flow anticipated for the following semester in a form acceptable

to your supervisor. Students providing a report below substantially expectations will be excluded from the FYP.

Whilst you can reasonably expect that your part A report will be read by your supervisor and face to face feedback be available in three weeks – IT IS YOUR RESPONIBILIY to contact and meet with your supervisor for this, do not expect them to chase you. Feedback will most likely only be available through a face to face meeting.

Part A Conference (Administrative requirement) – Due Exam Period of Part A

The FYP conference run in a similar fashion to academic or professional engineering conferences. There will be multiple, parallel sessions where a number of speakers will present their work completed/anticipated/results etc. to a mixed academic/peer/public audience.

You will be expected to present a 10-12 minute presentation of your FYP progress, in which you detail your work to date. This is to be followed by up to three minutes of questions. You will have access to a projector for this presentation. This is the opportunity to relay to your markers and fellow students "the greatness" you have achieved through your hard work and dedication to this project. If you have spent the requisite amount of time in the project, then 12 minutes of talk will be easy. If you find yourself unable to think of what to speak about, you should reflect and check your logs, on how much time you committed to the project!

The oral presentation is formatively marked to give you feedback on your presentation skills. 'Marking' is based on a number of factors, such as your general 'comfort' in presenting, ease of use of technology, ability to answer questions and the extent of progress that is apparent in the presentation. An online system is being used where feedback is provided by all students electronically via Smart Phone.

The oral presentation elements are part of a "compulsory course component" – Student not presenting or engaging in the conference may be excluded from the FYP - Refer to course outline.

Session Chairs

For each conference session, a session chair will be chosen at random from FYP part A students. **The roles of the session chair are many**. Timekeeping is one critical area and good session chairs are needed in this respect if nothing else. With parallel sessions running, often people will need to move from one room to another to view/grade the various presentations. You, as a session chair, must ensure a speaker does not run over their time allocation.

Other jobs include introducing the speaker, and/or leading and controlling the questions. If there is no question forthcoming from the floor, it is the session chairs obligation to ask one. This means the session chair must pay close attention to the presentation and have 'a question' ready as needed for each speaker.

NEW YouTube Submission (administrative requirement) Week 10 2nd Semester of study.

From 2020 onwards, a YouTube video presentation has been added to the FYP requirements.

This nominal 10 minute video, due in week 10 of your second semester of study, is for you to present a substantive 'progress report' in an oral/online mode. This YouTube video provides you with an opportunity for engagement with a multimedia presentation and helps you to consolidate and reflect on the work completed, and still to complete. You won't have completed your project and this is understood, but you are nearing the end and should be able to speak confidently about most of the project and most of the outcomes. The creation process will help you find a path to completion for your project.

You will provide a link to your YouTube for distribution to the class via an online form, and these links will be shared across academics and selected 3rd year students. There is an expectation that you will review a number of these submissions and post pertinent questions on the YouTube site for the owner to consider addressing during their defence.

The students in 2020 reflected positively about the creation of the YouTube with respect to helping them wind up the project and think though the logical presentation of content needed in their reports.

Part B Report (100% of FYP Marks) – Due Week 13 of Part B

Content

Your Part B thesis/report makes up 100% of your final year project mark, and should reflect the work completed over the duration of the project. This report should be of a suitable standard for a graduate engineer.

Your aim is for the report to be of high quality with 'near zero' spelling/typographical or grammatical errors. To achieve this outcome, you should anticipate 1 day per page of written text.

Whilst there is no minimum or maximum page count, a report that is only 10 pages long, no matter how well written, is unlikely to convey the requisite 360-420+ hours of work that the project should to cover. Conversely, a 300 page document is likely to be verbose (at best) and also not promote high marks. Please keep in mind that the two readers (markers) for your project report may have 10-12 reports to read in a week, any issue that makes the reader 'work hard' in understanding your report will likely negatively impact your overall mark.

Your readers should be assumed to have at the very least, a graduate level of knowledge in your reports area; at the end of your project you should be a specialist in that area. This means that the report needs to be written with an assumed level of knowledge equivalent to, or perhaps slightly above, where you started your project. You need a report to bring the next project student up to speed in the area, and convince us you are now very proficient in that subject area.

Whilst every FYP is different, unless there are exceptional circumstances which are agreed to by your supervisor, professional reports are written in the 3rd person. Furthermore, what you are producing is to a large extent, a technical thesis. This document will however contain more justification than a standard engineering report in industry, nonetheless you are reminded that this is a technical thesis (Engineering report) you are producing.

One significant different to a professional report, which might only report on the positive outcomes, is that reporting on your failures and the complexity of overcoming adversity in your FYP project is of substantial value for the markers to fully appreciate your work and

dedication to the project. Not every project is a succession of positive outcomes, so enabling your markers to understand to 'total journey' is often beneficial. However, the journey without outcomes and analysis - is of no value!

Immediately following your cover page will be a ***mandatory*** page of dot points that clearly articulates what you have achieved through your project. This is the 'no frills' run-down of your project. This must be factual and defendable as it may well form the basis of questioning during your seminars. These dot points can be thought of as the key things you will expand upon within the reports body. Note: tasks not relevant to your project as an engineer (e.g.: Collecting Pizza for the FSAE team) are not key achievements! It should almost be possible from the dot point summary to determine a basic grade.

EXAMPLE DOT POINT SUMMARY – F-SAE

I led:-

I significantly contributed to

I also

EXAMPLE DOT POINT – Normal FYP

I developed or I created

Appendix 1 of your report will be a graphic of your time on the project. This graphic (preferred) should enable a clear visualization of the time spent across the full project, if possible broken down to sub elements (literature review, mechanical design, simulation (time in front of computer, not CPU hours), etc).

No specific time tracking software is mandated, though 'Harvest' provide a free version which appears sufficient. Students are free to use whichever tool they prefer but are reminded that no time log is a reason to fail the project.

Appendix 2 + are at your discretion. However, if you have a large amount of computer code or other such things, do not include full listings as an appendix, reserve this for the required USB stick submission.

You are required to cite all referenced work appropriately and provide a reference list/bibliography. You will also be required to upload a soft copy of your report to turnitin for plagiarism checking. You must include the 1 page summary copy of the turnitin similarity report with your hard-copy submission.

Format

Two copies of your Part B report must be printed double sided on A4 paper, bound, with clear cover and card back. These will not be returned. Care should be taken to ensure that margins are sufficient for printing and binding. **AGAIN**, **Do not include 200 pages of**

MATLAB code or excel spreadsheets as an appendix to your report. Think about the value added for a reader.

You should include relevant files/code/plots/etc on a USB thumb drive or CD with your submission. These will not be returned. A cloud link is not acceptable for this submission as we have no assured longevity from a cloud link.

Headers and footers can be used as deemed appropriate in your document. As part of ongoing quality assurance work, reports from UoN are reviewed by academics at other institutions. *On the cover/declaration page on Blackboard, there is a statement that you acknowledge that this external review process might take place, and as such, if you choose to include your student number into your report, this information will be available to that reviewer. If this is of concern, please ensure you do not include your student number in the report*. Your inclusion of a student number implies your consent for that to be shared.

Referencing style

Please consult with your supervisor for their preferred refereeing style, which is influenced by what journals they publish in. If in doubt IEEE is 'common' in engineering.

You may consult the following checklist to help you ensure your report for Part B meets specification.

- Part B cover page (available on the appropriate Blackboard site).
- Dot Point Summary
- Release Consent, Declaration (available on Blackboard).
- Turnitin Originality Report.
- Abstract
- Table of Contents
- List of Figures/Tables
- "I cleaned my mess up" declaration!
- Report Body
- Bibliography/Reference List
- Appendix 1: Time spend graphic
- Appendix 2, 3, …Other Appendices as necessary

Non-conformance will result in a reduction of grade.

Marking

Your final submission will be reviewed by 2 independent readers who will provide a grade for consideration by the discipline marks committee. Provided those marks are within 10 marks from each other, the average of those grades will be awarded for the submission.

Where a disparity between the two submitted grades exist that is greater than 10 marks, a third reader is called who will independently provide an assessment. That third grade will be averaged with the nearest of the two original grades to achieve a final result.

Clearly, your report needs to be well written to optimise your final grade. High quality text might require in the order of 2 days per page! If you have a 50-page document than clearly you will not write this in 1 week and expect it to be of high quality. NOTE: A week of text polishing is probably worth more than one more data point in a graph!

Automated spelling and grammar checks are part of the standard editing software today. Be aware that the spell and grammar checks are not 100% reliable, Google "autocorrect fails" for examples.

Having a friend or family member who is not connected with your project proofread your thesis is a good idea! Having a fellow FYP student swap reports and cross read is a better idea. I cannot overstress the value of proof reading other peoples work as a tool to improve your own writing skills. This is not a chore, but an opportunity for you.

YOUR report should be written for an audience with a starting knowledge equivalent to your own at the start of the project. DO NOT try to 'bluff us' in your report – I will guarantee you that collectively we can see through any bluff and it only hurts your outcome. ***If you do not know 'it', don't prove it by writing 'it' down!***

Part B thesis defense (administrative requirement) – Due Exam Period of Part B

The part B conference normally runs concurrent with the Part A conference. From 2019, the part B students present a poster as part of an expected 1.5 hours session with a number of other Part B students. During this time, staff and students are free to visit as many posters as they desire. Your task is to impress them with the quality and quantity of work you have completed in your project.

Your defence should be considered as the second stage of the oral defense stemming from the YouTube video. Not all your visitors will have watched the video, so expect to get some questions on ground you believe you have covered. If able to conduct this defence face to face, then a poster (A1 size) that provided the highlight of the project should be on display as your main 'prop'. You are free to have a computer with supporting information/displays. You should have an A4 page of questions (and answers) resulting from the YouTube video. As visitors come to your poster, work between your resources to engage and inform them.

If we are forced online, a 15 minute time slot will be allocation where you recap (not repeat) your YouTube, provide scripted answers to the posted questions, and then 'deal with' impromptu questions.

The Mechanical Engineering Workshop

Many of you will design test rigs that are integral to your FYP and need these to be manufactured. The Mechanical Engineering workshop can manufacture almost anything.

There is a process you must follow & under no circumstances is it a self-serve area.

Given production, commissioning, experimental and analysis time, no new builds will be considered after the first week of your Part B. We will not accept 'Placeholders', IE each set of drawings should be complete and ready for full implementation.

Consultation &/or the Design Process

Before approaching the workshop staff, you should discuss the design with your supervisor. Design is a naturally iterative process that commences with the identification of the true requirements and constraints. Avoid picking the first thought you have and pursuing that as the only option. Whilst it might turn out to be the best solution, you should consider a number of different approaches for any design.

For many FYP students, this will be the first time you will independently design something that will be built and have expectations of it to work. Make logical use of the University staff available to you. Your supervisor should be able to help with the constraints and requirements but may not be able to help (too much) in the translation to a functional device.

The workshop manager, and the workshop staff are highly skilled individuals who can advise you on ways to optimise your designs for production and operation. Once you have worked out the majority of the design, it can be very rewarding to discuss the production of your rig before its design is fully finalised. Our senior mechanical engineer, Dr Michael Carr, can advise and assist you in your design process. Mr Ian Clarke can provide detailed advice on the construction process and general laboratory use issues.

Machinists should not be directly contacted; all dialogue should focus on the laboratory manager or the senior mechanical engineer first.

Any request for work needs to undergo an approval process before work can commence. For all but the simplest tasks, **a FULL set of engineering drawings are needed**. They should form part of your final submitted report as either an appendix or as appropriate in the main body. A minimum requirement for drawings is a **set of part or component detail drawings** for the items to be made **+ a general arrangement (GA) drawing** illustrating how the object is to be assembled. This is irrespective of if you plan to assemble it yourself or not.

No GA = No Work.

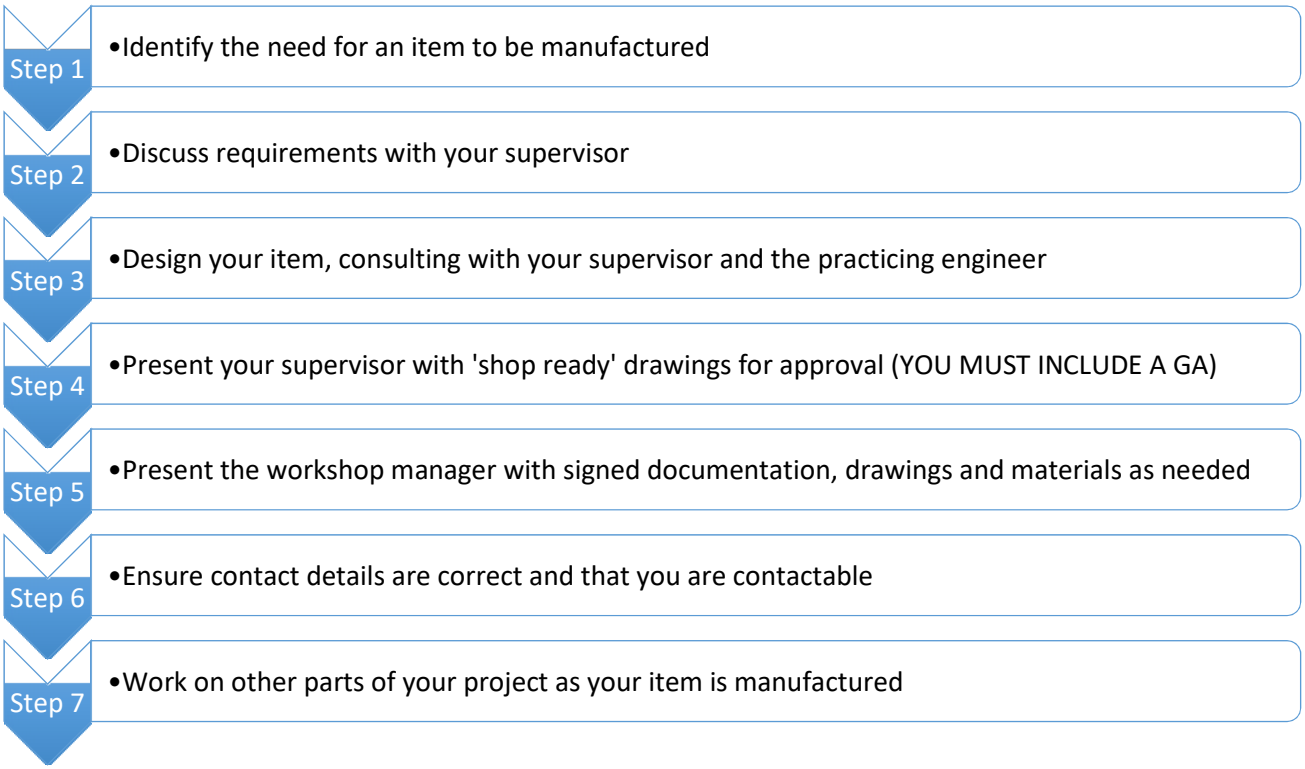
If you are modifying an existing test rig, then the production of a GA may not be feasible or warranted, in that case some reasonably clear photos and a well worded description of how the parts you are requesting to be manufactured will fit/function/effect this device is

needed. THIS IS IN YOUR INTEREST. Many times, projects have encountered difficulties when these protocols have not been adhered to by virtue of the design and/or dimensions not being what was actually needed, requiring re-work or reproduction.

Turnaround Times

At peak load times, anticipate a delay of 4 weeks to get an object started in the workshop from the time of production approval. If you mess up, expect any resolution to take at least 4 extra weeks.

Work Request Approval Process



NO STUDENT IS TO SUBMIT WORK DIRECTLY TO THE WORKSHOP STAFF. For a task to be commenced in the Mech Eng Workshop, **a full set of drawings** is required **and** the correct workflow is needed. WITHOUT THESE, EXPECT TO BE TURNED AWAY.

The development of drawings needs to involve your supervisor to ensure that the proposed outcomes can be met through the designed object. The Mech Eng Professional Engineer Dr Michael Carr and/or Ian Clarke can be called upon at any stage for advice to make your projects creation as optimal as possible.

Irrespective of the above preliminary work, once the detailed concept stage is completed, **you must meet** with Dr Michael Carr to undergo a technical design audit. As a result, design improvements might be a requested to facilitate the production of your device. This process will be iterated until a final set of details are approved for the Mech Eng Workshop to be engaged.

With Dr Michael Carrs' and your supervisors signature attached, the student will provide a complete set of drawings to Mr Ian Clarke for scheduling into the Mech Eng Workshop area.

Note: Your academic is only signing off that the 'Concept' of your design meets the needs of

the project. Having your supervisors signature does not guarantee it will work!

At this stage, you should have already consulted with the Dr Michael Carr several times.

The Mech Eng Workshop is a high value asset to the discipline – they are not going to make things that can be bought for a fraction of the price outside. Keep this in mind when designing things – look to make use of standard parts if, when and where appropriate.

Allow $150/hr for workshop time when considering 'should I buy, or make', ***don't waste the limited resource we have***.

RISK ASSESSMENTS:

In addition to your drawings, risk assessments for non-standard manufacturing/maintenance/upgrade work is required. This might be to indicate, for example, that a particular exotic alloy is neurotoxic when machining residue is inhaled.

A standard materials stock list is provided in Appendix B of this document to assist you in general design work. Non-standard materials, or if a significant quantity of standard material is needed, will require purchasing prior to construction. This is your responsibility through the Mechanical Engineering purchasing staff.

Student Workshop

You all should be aware of the student workshop located in EC. Providing you have completed the workshop component of GENG1000 (MECH1110), you are able to make use of this facility.

Remember that the EC staff are there to help you go home with all fingers and toes in their correct locations, please ask their advice. IF IN ANY DOUBT - ASK

Remember:

- Do not do anything you are not really sure about
- Do not try things you are not competent to do (IE Most things)
- 100% drug and alcohol free at all times!
- **SAFETY – If you cannot do it safely, don't do it at all.**
- **TAKE 5**. Before you commence a task, spend 5 seconds to check all the risks are mitigated. ***Have you asked advice from an EC staff member***!

Additional Lathe tools are available through Ian Clarke, provided you can convince Ian you have the skills to use them.

Report all broken and damaged tools/equipment to Ian Clarke.
This is to ensure we have a full complement of tools when needed, not to berate you for the accidental breakage of a tool – tools break, its part of making things.

CLEAN UP after yourself.

If you intend to 'Help' our workshop staff by making bits for your project, that is fine. Please make sure that if you make something, you have the skill to make it right. It is pointless if your ambition exceeds your skills to the point that the item 'you made' to help speed the creation of your test rig, means that the workshop staff need to 'improve' your component which often takes far more time than if they had simply made it themselves.

Workshop – Electrical

Mechatronics and Mechanical Engineering have a staff member responsible for instrumentation and electrical work. If you need sensors, dataloggers, strain gauges, etc – you should contact Mr Mitchel Gibbs in Building EC.

The electrical/instrumentation design should be considered throughout the design phase of any test rig. Mitch can advise on design options to enhance the success of your project and can offer limited assistance with the installation of appropriate sensors. Where new sensors need to be purchased, once you think you have selected the best unit, discuss it with Mitch and then your supervisor who will have to pay for it.

Setting up experiments

Often as part of your project you may need conduct experiments to either validate theoretical data or gain insight into your problem. Speak with your supervisor about what kind of testing is appropriate and devise a method to carry it out. You can also talk to the EC staff who will be able to point you in the right direction or assist directly.

The EC building has a vast array of experimental equipment that is available to students. Understand that some of this equipment is 'owned' by various academics and you may need to seek their approval to use it. You may also be required to book time on some of the more popular equipment. Plan ahead appropriately and have all your 'ducks in a row' prior to commencing.

All common equipment has already a risk assessment and SOP completed for them, you MUST read and understand these before starting. If you are doing ANYTHING out of the ordinary you must also complete a separate RA and SOP to cover only what is different and have these approved by both your supervisor and the workshop manager. Much of this equipment is more than capable of doing a great deal of damage to itself or YOU so this is all for your protection.

We do NOT expect a 20 page risk assessments or SOP's, they need to be clear and concise or else they become unusable. However, if you design a complicated piece of test equipment the SOP and RA may be a considerable amount of work. Writing easy to understand instructions is actually quite difficult! These can (and should) be attached as an appendix of your thesis.

Templates for all SOP and RA's can be found through the Mech Eng blackboard "EC" induction site or as hard copies outside the lab mangers office, though the final product needs to be in a digital format.

While an experiment is in progress you need to have an aptly named 'Safe Work in Progress' form filled out and attached to your experiment. This is to ensure that nobody disturbs it and that third parties can be confident that everything is being conducted safely.

Talk to the lab manger about any other safety requirements for you experiment.

Always:

- Ask for help, the EC staff are there to assist you.
- Report any damage or incidents immediately so that we can rectify and give appropriate guidance.
- Leave equipment tidier than you found it. If you walk into a mess, let the EC staff know.

Purchasing

Purchasing at the University can be a complex task. If you need something for your project, and it is approved by your supervisor for purchase, there are several ways to proceed.

The most formal, **and thus correct** way, is to fill out a purchase request form, have your supervisor put an appropriate cost collector (account #) onto the form and sign it. Provide this form to our Mech Eng purchasing officer and they will procure the item.

You may be able to buy small items yourself and claim a cash re-imbursement. *THIS NEEDS PRIOR APPROVAL*, if you turn up to claim money and your expenditure was not previously approved don't be surprised if we are unable to approve it.

There are restrictions on the purchase of certain good within the University and deviance from these purchases can be problematic. As an example, the University fleet cars must use Caltex fuel, if a F-SAE member takes a jerry can and fills it at Mobil, we may not be able to claim that money back.

No Pre-Approval = no claim;
No Receipt = no claim;
No Prior Approval = no claim *(just in case you missed it)*

Extensions of Time

Extensions beyond the formal due dates are not generally possible. If you believe that extenuating circumstances have impacted your progress, you should discuss this with your supervisor and seek their full and unconditional support before lodging appropriate adverse circumstances documents to the course co-ordinator. THIS MEANS – your email to me needs their email support embedded – otherwise I will refer you back to them!

With changes in the graduation process at UoN, where students completing all requirements for their degrees in Semester 2, will 'walk the stage' in mid-December that same year, ANY extension – adverse circumstance – Reasonable Adjustment Plan etc WILL MEAN you are likely to miss that ceremony. This does not impact on your status as a graduand, only the ceremony – which is just that – a ceremony.

Any form of late submission is problematic for grading. If you are allowed to submit late, expect a delay in the grading process. A small extension can unfortunately translate to a large delay in grading.

Requesting an extension on the basis you did not engage in the FYP process early enough will be refused.

Frequently Asked Questions

What is a suitable project?

When you choose a project, keep in mind its main purpose is to SHOW that you are capable of "personally conducting and managing an engineering project to achieve a SUBSTANTIAL outcome to professional standards". This means that you need a project that satisfies two main criteria:

- It must allow you to provide assessors with EVIDENCE of your capabilities
- It must be SUBSTANTIAL and challenging enough to allow you to demonstrate the professional capabilities required of graduates of the program.
- If the project you choose involves a 'routine' design or involves unproblematic testing and analysis, you will most likely not receive a high (or even passing)grade, so think about how the scope of your project can be enhanced to allow you to best demonstrate your capabilities. Discuss this with your academic supervisor.

What is involved in industry-based projects?

An industry-based project can be a project sponsored by your employer. Alternatively, it can be a project sponsored by a client who wants some work done. In each case, you will have an industry liaison person who will assist you to obtain resources and information. Such liaison persons who are also engineers may also assist you as an industry supervisor.

The role of the industry supervisor is to provide technical advice and support. The role of the academic supervisor is to provide teaching assistance and to assess students work. Every project student must have an academic supervisor appointed by the University.

If you have a prospective industry project and your industry liaison person or industry supervisor have concerns or questions about what is expected of them, email the projects course coordinator to arrange for them to discuss requirements.

Some industry projects may require confidentiality agreements to protect intellectual property and/or manage political consequences of possible findings. If your industry supervisor is concerned, the University can offer confidentiality agreements to cover the different circumstances that may occur. NOTE: Some Intellectual Property agreements and confidentiality agreements can take longer than the entire FYP to resolve. If you workplace is seeking a legally robust and binding agreement, then perhaps that project should be avoided.

An industry FYP is not an opportunity for industry to have commercial work undertaken under the guise of a final year project.

How should I find my supervisor?

It is your responsibility to find an academic supervisor and a project.

It will be easier to find a supervisor if you begin your search early, there are limits on the numbers of project students a supervisor can take on. You should first approach academic staff who offer projects in an area of your interest.

You will need an academic supervisor for your project even if it is an industry based project, or a self-created project. If you have arranged an industry project or a project with your employer, you will also need an industry supervisor to advise and help you obtain resources.

What is required in my project outline?

If you are developing your own project, or intending to undertake a work/industry based project, you are required to write a project brief/outline identifying the aims and method for the project. You need to identify what resources you might realistically need to facilitate a successful project outcome. You should try to identify potential 'road blocks' that might occur and ways to circumvent them.

This brief should be provided to a potential academic supervisor for approval and acceptance.

Who is the course coordinator: Final Year Engineering Projects?

The Projects Course Coordinator is currently Prof Bill McBride Email: bill.mcbride@newcastle.edu.au

What is the extent of my (the student) responsibility for the project?

You will need to show that you are "personally conducting and managing an engineering project". This means that you must be proactive and take control of your project.

This will be easier if the project is something you are really interested in, so start thinking about finding a good project topic some time before you start.

The project is not like other courses where you have a teacher leading you through the work week by week. You will need to work out your own schedule, and make adjustments as problems arise to show your professional capacity to deliver a project on time.

Your supervisors are the mentors for your final year project and should be consulted regularly as part of any major decision making process related to the project. Particularly towards the end of your project, you should be more knowledgeable than your supervisor in the specific area you have pursued as your project. Irrespective of this specific knowledge

base, you may not be fully conversant with the 'bigger picture' which your supervisor will be. Talk with your supervisor often.

Who will assess my project?

Your project will be assessed by two markers as discussed in the Part B report section of this document. However, some additional points are below.

Keep in mind that your assessment is not just about the final result of the project. It is about the assessment of the professional capabilities you have developed in addition to what you have learnt and expressed in your report. Your final project assessment will be done by your supervisor and at least one other marker. The marker will not know about the discussions what went on between you and your supervisor; their assessment will be based on your thesis and the evidence you provide within to the marker of what you did in your project and why you did it.

While it is important to describe clearly what you did and the outcomes of your work, what they will really be looking for is evidence of the thinking processes behind your project choices and decisions. They will want to know WHY you did what you did, and you will need to present this clearly.

- What did you read? How did you relate or not relate the readings to your project?
- What sources of information did you use? How reliable and useful were they?
- What methods did you investigate? Why did you choose to use particular methods?
- What theories guided your decisions? Why did you use them and not others?
- What problems did you encounter? Why did they arise? How could they be avoided?
- What failed, and what did you learn from that?
- Did you waste time on trivial tasks, or focus on significant value adds?

NOTE: In engineering workplace practice, the main focus of a project is on the outcome, the design or the results of a test or an investigation. The thinking behind workplace project decisions may be discussed by the project team and may be recorded informally in notes and sketches but this educational assessment project is different. For example, simply stating that 'object X' was used in the test rig is probably fine in a consultant's report, but in an FYP report it is appropriate to defend that choice to a sensible level. So your FYP report needs to include both the outcomes and the process/decisions required to get to that outcome.

With many research projects, a negative outcome is still a reportable outcome. So whilst you might be disappointed if a research avenue does not yield the result you are seeking, this is a valuable element to include in your report. These 'failures' often provide insight that leads to success, and in the case of your FYP is still attributable (billable) hours worked on the project.

What are the course requirements?

The main requirement is the previous completion of at least 210 units of coursework to ensure you have sufficient engineering background to complete the project in a satisfactory way.

If I am designing something, do I need to create a finished part to prove the design?

Whilst it is always nice to have a prototype completed for 'show and tell' in the final seminar, this is not always achievable. A well designed and well documented design is fine as an outcome, providing the scale of that design is appropriate. Expecting a high final grade when the design presented in reality represents say 50 hours of work, is a false expectation. If the design presented truly represents 400 hours of high quality work, then there is no

reason not to expect a high grade. DISCUSS THIS WITH YOUR SUPERVISOR.

Does one style of project guarantee a better final grade that another style?

NO! The students work ethic and approach to their project dominates the grade.

Naturally some projects have different starting and end points. Many academic sponsored projects are scalable meaning it might be suitable for a 'P' student through to a 'HD' student.

Diversity is perhaps the only word that sums the final year project sphere of projects. Projects can vary from:

- Highly theoretical, e.g. I wonder what if…
- Applied research, e.g. Hmm - how do I…
- Design, Build, Experiment type project e.g. F-SAE, Robot X
- Industrial targeted projects – e.g. Optimising/fixing a process thing

In the end, it is only your effort and dedication to sound engineering practice that affects your grade.

Appendix A: FYP Supervisors Reports

Your project supervisor may not mark your thesis, the supervisors sheet is used to provide insight into the operation and management of the project by the student. There is no dialogue between the markers and the supervisors as the reports are completely independently marked.

3Student Name: **Student initiated project?** Y N

Project Title:

Supervisor name:

1. **Complexity/Difficulty of the project** - 1 trivial to 10 difficult and open-ended (____)

2. **This student was in contact with me**: Daily Weekly Monthly (____)times over the project

3. **During their project they were**
   Driving the project
   Following broad direction
   Following detailed direction
   Not appearing to follow any direction

4. **In terms of the thesis, I have**
   Not read a draft – not provided?
   Read Part A progress report
   Read a (Part A+B) thesis draft
   If read, ( )
   (e.g. poor, good, excellent, etc)

5. **The student's grasp of their topic area now appears to be: .....**
   Excellent
   Good
   Satisfactory
   Poor
   Not observed

6. **Details of any significant impediments to the students' progress (e.g. lack of analytical skill, equipment failure):**

7. **Summary of the achievements and strengths of the work completed:**

Signed

Appendix B: FYP Marking Guidelines

The following marking guidelines will be used in the assessment of your project.

The University of Newcastle
Faculty of Engineering and Built Environment
School of Engineering
Discipline of Mechanical Engineering

Project Review form (A or B, SEM 1 or 2) Please circle

(Criteria and achievement level descriptions follow**)**

MECH4841 Mechanical and Mechatronics Project

Student Name: Student Number: (opt)
Project Title:
Supervisor:

Apparent:

Volume of work	Basic	Moderate	Exceptional
Depth of engagement	Basic	Moderate	Exceptional
Engineering approach	Basic	Moderate	Exceptional

Quality of written work
Many spelling/Grammatical Errors Few spelling/Grammatical Errors Almost Error Free

Logical Flow of Information
Hard to follow not easy to follow Easy to follow Exceptional

Level of Material presented
Basic Good Too high*

Project Outcome:

Basic Good Well Above normal expectations

Concerns of:
Plagiarism Poor referencing Other (explain)

Overall Impressions

Suggested grade:

* - The intended audience for these reports is a ‘mild stretch’ for in incoming project students. Whilst material well above incoming student level is appropriate in these report to demonstrate depth, it should not be written such that the reader needs to complete 400 hours of background research to understand the written document.

Fail Student has failed to demonstrate sufficient independence and suitable work ethic/outcomes that can only be addressed through the completion of a new project.

It might be that the problems tackled are no more than those expected from a junior student level, or that the student fixated on one element at the expense of the rest of the project.

Incomplete Student appears to have made passable progress in their project but has failed to articulate this in a sufficient way to award a passing grade. Normally, an incomplete grade is awarded to students whose report does not meet the calibre of the work that is known to have been completed. An Incomplete grade in FYP is likely to defer your graduation – Hence it is important to ensure your report is robust on submission.

Pass Student has pursued the project to a minimum defendable standard and generated an outcome that has progressed the project area forward. From an objective view point, it should be clear where and how the student expended 400 hours and that the outcomes/analysis/thesis represent ‘value for money’ to a client paying for this work.

Credit Student has clearly demonstrated an ability to manage their final year project within its scope and bounds to generate a meritorious outcome. Clearly pushing the overall scope of the project forwards.

Distinction Student scoring in this area will have demonstrated their ability to ‘take the project and run’. They may or may not have had much interaction with their nominal supervisor but will have clearly pushed the project forward. They will have solved complex open ended problems commensurate with a distinction level graduate engineering. Their reports will be easy to read, concise, and with almost no errors.

High Dist. As above, except well above expectation. This might embody something that is publishable, or in other cases simply an outstanding volume of work or project outcome - created through significant effort and insight on the part of the student.

Appendix C: Mechanic Engineering Workshop Stock

Aluminium Sections
Stored at Mechanical Workshop

Section RHS Square	Lengths	**Section Equal Angle**	Lengths	**Section Sheet**
12.7x12.7x1.6		12x12x1.6		2400x1200x0.6
20x20x2.5		16x16x1.6		2400x1200x1.0
25x25x1.6		20x20x1.6		2400x1200x1.2
25x25x3.0		25x25x1.6		2400x1200x1.6
32x32x3.0		32x32x1.6		2400x1200x3.0
40x40x3.0		40x40x1.6		
50x50x3.0				
		16x16x3.0		
		20x20x3.0		
Section RHS Rectangle		25x25x3.0		
30x8x1.2		32x32x3.0		
40x20x3.0		40x40x3.0		
40x25x2.5		50x50x3.0		
50x25x2.5				
		50x50x4.0		
		40x40x6.0		
Section Flat Bar		50x50x6.0		
12x3				
16x3		**Section**		
20x3		**Round Bar 2011**		
25x3		10mm		
32x3		12mm		
40x3		16mm		
50x3		20mm		
		25mm		
12x6		25.4mm		
20x6		30mm		
25x6		36mm		
32x6		42mm		
40x6		50mm		
50x6		60mm		
100x6		80mm		
		100mm		
50x10		130mm		
100x10		150mm		
50x12				
100x12				
		Section		
50x20		**Extruded Tube**		
100x25		10x1.2		
		12x1.6		
		16x1.6		
		20x1.6		
		25x1.6		
		32x1.6		
		40x3.0		
		50x3.0		

Stainless Steel Section
Stored at Mechanical Workshop

Section RHS Square		Lengths	**Section Equal Angle**		Lengths	**Section Sheet**		Lengths
12.7x12.7x0.9	304		20x20x3	304		2400x1200x0.55		
19x19x1.2	304		25x25x3	304		2400x1200x0.9	316	
19x19x1.6	304		40x40x3	304		2400x1200x1.2	316	
25.4x25.4x1.6	304							
31.8x31.8x1.6	304							
38.1x38.1x1.6	304		25x25x5	304				
			30x30x5	304				
			40x40x5	304				
			50x50x5	316				
25.4x25.4x1.6	316							
38.1x38.1x1.6	316							
50.8x50.8x1.6	316		25x25x6	316				
			40x40x6	316				
			50x50x6	316				
Section Flat Bar								
3x20	304/316							
3x25	316		**Section**					
3x40	304/316		**Round Bar 2011**					
3x50	304/316		6mm	316				
			8mm	316				
			10mm	316				
			12mm	316				
5x25	304/316		16mm	316				
5x40	304/316		20mm	316				
5x50	304		25mm					
			40mm					
			50mm					
6x25	304/316							
6x40	304							
6x50	304							
			Section					
			Round Welded Tube					
			12.7x1.6	316				
			15.9x1.6	316				
			19.05x1.6	316				
			25.4x1.6	316				
			31.8x1.6	316				
			50.8x1.6	316				

Steel Section
Stored at Mechanical Workshop

Section RHS Square	Lengths	**Section flat Bar**	Lengths	**Section Bright Round**
13x13x1.6		20x10		50mm
16x16x1.6		25x10		57mm
20x20x1.6		40x10		65mm
25x25x1.6		50x10		75mm
25x25x2.5		100x10		100mm
30x30x2.0		150x10		150mm
30x30x3.0				
35x35x1.6		25x12		
35x35x2.5		40x12		
40x40x2.5		50x12		
40x40x3.0		100x12		
50x50x2.5		150x12		**Section Round Tube ERW**
50x50x3.0				12.7x1.6
		50x16		16x1.6
		100x16		22x1.6
Section RHS Rectangle				25.4x1.6
50x20x2.5		50x20		32x1.6
50x25x2.5		100x20		
65x35x2.5				
75x25x2.5		3"x1"		**Sheet Mild Steel**
75x50x2.5		3"x1 1/2"		2400x1200x0.75
100x50x4.0				2400x1200x0.95
		Section Equal Angle		2400x1200x1.2
Section Flat Bar		20x20x3		2400x1200x1.6
10x3		25x25x3		2400x1200x2.0
13x3		30x30x3		
16x3		40x40x3		
20x3		50x50x3		**Sheet Galvanised**
25x3				2400x1200x0.55
30x3		25x25x5		2400x1200x1.1
40x3		30x30x5		2400x1200x1.6
50x3		40x40x5		
		50x50x5		
20x5				**Zincanneal Sheet**
25x5		25x25x6		2400x1200x0.55
30x5		30x30x6		2400x1200x0.9
40x5		40x40x6		2400x1200x1.5
50x5		50x50x6		
100x5				
150x5				
		Section Bright Round		
20x6		4.76mm		
25x6		6mm		
30x6		8mm		
40x6		10mm		
50x6		12mm		
100x6		14mm		
150x6		16mm		
		19.1mm		
		20mm		
25x8		25mm		
40x8		28.5mm		
50x8		30mm		
100x8		31.8mm		
150x8		41.2mm		

Appendix D: Formula-SAE Addendum

Formula SAE is an international engineering design competition that challenges university students to manage a project as a team. Teams are to assume that they work for a firm that is designing, fabricating, testing and demonstrating a prototype vehicle for the non-professional weekend competition market. The vehicle is to be a small, open wheel, Formula style race car which should have very high performance figures in terms of acceleration, braking and handling.

Additionally, design factors such aesthetics, cost and reliability must be considered. There are comprehensive specifications that must be adhered to.

Teams attend one (or more) of the 13 annual Formula SAE competitions around the world to have their prototype evaluated against other competing designs to determine the best overall vehicle. Vehicles are judged out of 1000 points in both static and dynamic events.

There are three static events (Presentation, Engineering Design and Cost Analysis) counting for 325 points with the ultimate goal to "sell" the design to a "corporation/venture capitalist" that is considering investing a large sum of money to the production of a competition vehicle.

The five dynamic events (Acceleration, Skid-Pad, Autocross, Efficiency and Endurance) count for the remaining 675 points to determine the highest performing, reliable and fuel efficient vehicle. NU Racing is The University of Newcastle's Formula SAE team and has competed in the Australasian competition since 2003.

The engineering to make a race car is not that complex. There is a lot of detail work that needs to be done, and done well. To maximise your outcome at the 'event', it is imperative that you not only reach a solution that is optimal in one area (ie weight, cost) but optimal across all of the team's design criteria.

> There is only one project outcome, and that is to maximise the score at the event by steadfastly adhering to the team design principles. Everything you do is in service of this goal.

All members of the team will follow a structured design process set out by the work of past team members. This is designed to maximise point gain in the Formula SAE Australasia event through cost benefit analysis to maximise use of the team's limited resources (personnel, time, money). A system which is functional, well tested, and integrated with the overall design has been shown historically to produce more points than a more 'optimal' design that takes longer to produce, diverts time from other areas and delays the completed manufacture of the car.

> Your project is a contribution to a team effort. All decisions should be discussed and agreed upon for the good of the overall outcome. This might mean 'your' special pet project that you have sweated blood over, might get shelved or modified at the last minute. This might mean that you forgo an optimal solution for one which is cheaper/easier to manufacture/simpler. Fine. ***This project is not about you***.

Engineers make decisions based on data and research. The proposed design which is predicted to make the greatest contribution to competition success will be selected to develop and manufacture, even if it is less innovative or technically challenging as a personal project. This will in turn produce better marks for your project.

You must also be aware that other projects (including FYPs) may depend on your timely completion of tasks. Having components designed and built early enough to be thoroughly tested and driver-trained is far more effective than shaving off a few extra grams, or gaining a few extra Newtons of downforce! Your marks depend on you getting the most points per man-hour and most points per dollar spent.

Each project student will have a particular set of reportable items. These reportable items will form the basis of your report and stem from the work you have completed towards the main objective – **Winning the F-SAE Australasia Competition in Melbourne**.

Team Structure

Formula SAE is a team project, and you may be managed by the Team Leader and Chief Engineer. You will be required to attend regular meetings, and provide progress updates.

Project Deliverable Changes

Formula SAE projects differ slightly from regular FYPs due to the nature of the competition. In addition to submitting documentation that will make up your FYP report, you will also be assessed on your ability to meet team deadlines, communicate and produce a number of mandatory submissions for the competition. The specific details will be discussed and agreed upon by all FYPs, team management and the academic supervisor.

Appendix E: RobotX Addendum

Speak with Adrian and Alex F.