MEC2402 Design Methods: Project Brief (Malaysia)

The Major Team Project is worth a total of 56% of the marks for this subject, and is broken down into 4 key submissions:

Deliverables	**Marks**	**Deadlines**
1. Preliminary Submission	**(12%)**	**Thursday 3rd April (W5) 11.55 pm**
2. Milestones	**(6%)**	**During Team Meetings (W4-10)**
3. Prototype (Competition)	**(12%)**	**During Thursday evening 6.30pm -10.30pm 22nd May (W11)**
4. Final Report	**(26%)**	**Thursday 29th May (W12) 11.55 pm**
Total	**(56%)**	

This document provides the requirements and the marks allocation for the Submission of the Major Team Project. Additional information and updates may be released later in-semester while the Q&A section will be expanded over time. Please read these instructions carefully and consult your lecturer if you have any questions.

Project Description

You may only need to choose one of the following projects for the whole semester.

1. Warman competition description. (*Default project*)

- **https://warmandesignandbuild.org.au/**

2. Shell Eco Marathon project (SEM) description. (*limited slots*)

If you are interested in taking SEM projects, please attend the short introductory and briefing session, which will take place on Zoom on Friday, **7 March 2025, 6.00 pm.**

- Project brief and Zoom link (Link)

3. Robocon project (ROBO) description. (*limited slots*)

If you are interested in taking ROBO projects, please attend the short introductory and briefing session, which will take place on Zoom on Friday, **7 March 2025, 7.30 pm** (Link)**.**

- Project intro (Link) and Project brief (Link)

- Project descriptions (Link)

4. Formula SAE project (FSAE) description. (*limited slots*)

There will be slight variation to the mark allocation for FSAE project. If you are interested in taking FSAE projects, please attend the short introductory and briefing session, which will take place on Zoom on Friday, (**Thursday (6/03/2025), 8.00 pm** via Zoom (Link))

Those who are interested are encouraged to attend the briefing.

- Project brief (Updated 18/2/2025) (Link)
- Topics (Link)

1. Prelim Submission (12%):

a. Problem Definition (OFFERS Analysis): 3 %

b. Creative Solution Generation (Morphology Method): 3 %

c. Isometric Concept Sketches (Individual, 1 each): 3 %

d. Decision Making (Composite Criterion Method): 3 %

Total 12 %

This submission should be named: ***SWARXX Prelim Submission.pdf*** and submitted through a Google Drive folder, which will be created by your Project Supervisor in Week 4.

- In this assessment, you may use generative artificial intelligence (AI) to generate supporting materials or content in relation to the assessment task.
- You can receive support from Studiosity if you ever get stuck with writing (Moodle → unit information).
- https://sites.google.com/monash.edu/studiosity/faq
- https://support.studiosity.com/en/articles/112644-how-does-studiosity-work

a. Problem Definition (OFFERS Analysis)

Please present the OFFERS process you have been taught. Your team should present your planned Functions for the prototype as a flowchart. The best way to do this might be to make the flowchart in MS PowerPoint or Google Slides, then take a screen clipping and embed this image in your printout. Swap to a landscape orientation or even A3 if you need the full page. Please ensure you include adequate detail on all the topics, including a table of Requirements, Specifications and Weightings.

b. Creative Solution Generation (Morphology Method)

You may use the same template provided under the Ideation topic within Moodle. Use the same functions that you have developed from the OFFERS Analysis in this document. You will be required to develop at least 4 alternative solutions, but for larger teams, you will need 5 so that each member can take ownership of one unique alternative solution as the basis for the next task in producing Isometric Sketches.

c. Isometric Sketches (Individual marks)

Each student in the team should produce their own isometric sketch (only hand-drawn) on an A4 (preferred) sheet of one potential solution developed through the morphology method. Each student should draw a different concept (using different concepts for the functions). They are not allowed to repeat any particular alternative (a couple of similarities are acceptable). We strongly recommend you use Iso grid paper (available from Officeworks or print off the sample provided on Moodle), but it is not compulsory. You can also draw an axis onto a plain sheet of paper, provided the isometric angles are consistently aligned. CLEARLY write each student's name and student number on each of these sketches, as marks will be awarded on an individual basis. You will be marked on the quality of your drawing and the detail you are able to capture. Take some time and show us your best effort.

d. Decision Making (Composite Criterion Method)

Based on these four (or Three for teams with 3 members) concepts, please complete a formal decision-making process to select the best concept for the prototyping stage. We recommend using the Composite Criterion Method, which we have practised in class. Please check that your final concept is statistically significantly better than the other options. You should include calculations and explanations on your team's final design decision

2. Project Weekly Updates and Milestones (6%):

There are 3 flexible milestones throughout the project, on Weeks 6, Weeks 8, and one more milestone by Week 10. Each team may demonstrate the milestones during/ before the week's class. Each milestone is elaborated in the following:

a. **Start, Stop (Weeks 5-6)**: Weekly updates + To acquire parts for prototype construction – each team should have at least one Arduino, motorshield, wires, a power source (Any form of battery or power bank), push start button, voltage regulators, 3 tennis balls and other construction materials such as corrugated cardboard for prototyping. If parts do not arrive on time, you may demonstrate this milestone with proof of purchase. The prototype can be switched on via a **push-start action.** The device **must move, touch the ball(s) and stop**.

b. **Collect (Weeks 7-8)**: Weekly updates + The prototype/part of the prototype can collect at least 2 balls from the initial supporting structure after a single action start. The balls must be fully contained within the system. The system must perform the task in milestone 1 (Start, Stop)

c. **Deposit (Weeks 9-10):** Weekly updates + The prototype/ part of the prototype mechanism must **deposit** at least two tennis balls after a **push-start action**. The system may start from the collection point. The system can fully support the balls at the start.

Team members must demonstrate their design or lodge relevant videos/ proofs during your allocated practical sessions for the specified weeks. You must upload them into a Google Drive folder, which will be created for you at the start of the semester. Your tutor will review them during your weekly team meetings.

The first 3 teams to achieve a perfect mission prior to Week 11 Monday (6 pm) (Complete full task with a deposit of all 3 balls within 120 seconds) will get **a minimal score of 10% for the competition**. The maximum score will still be capped at 12%. The team will still need to compete in the campus final, for a chance to go to international competition.

The prototype may differ from the exact design based on your original Prelim Submission. You may make changes and modifications to obtain the best performance.

These milestone marks may be deducted for an individual if the member did not actively participate in team meetings during the practical session. Active participation will be gauged during team discussions.

Aside from project milestones, For every Week 4, Week 6, Week 8 and Week 10, each team is required to prepare a Project Plan on how to achieve each milestone. Each member of the team needs to highlight what they are doing. The weekly updates will contribute to ITP Metric.

Project Plan includes

- Target Deliverables and Person in Charge:
- Expected time:
- Challenges:

3. Prototype (12%):

Team performance : 12 %

Total 12 %

Team Performance

For Team performance, the score will be based on the calculation of your respective project rules and later factored to 12%. The calculation will be conducted according to project rules unless otherwise specified by the teaching team.

4. Final Report (26%):

1 – Final Design Report (Team) 8 %

2 – Formal Engineering Drawings (Individual) 12 %

3 – CAD - Design Fabrication (Individual) 6 %

1 – Final Design Report (PDF)

This report should be named: ***SWARXX Final Design Report.pdf*** which contains:

Title page:

Include the unit code and unit name, the report name, your team number, a nice render of all your CAD designs or pictures of your actual prototype and small headshots from all team members, with names and student numbers listed adjacent to these headshots.

Executive Summary (150 words max):

Concisely summarise your final prototypes and how it addresses the problem. If you have referred to existing designs, you can compare your final prototype to the closest resource.

State your word count for this section in brackets, at the end. i.e. (142 words)

Table of Contents:

Please include page numbers and section numbers ie 1.0, 1.1, 2.0 etc

1.0 Introduction to the prototype (2%) (Maximum 300 words, excluding captions or tables):

Based on your team final competition prototype:

- Present the design using photos or CAD images.
- Describe the ideas/function of your prototype.
- Document the materials used and the average cost spent on the device. You may include a table to summarise a breakdown of the expenditure for the Prototype. Estimates can be made for small items such as cardboard, glue, 3d printing filament. You do not need to include construction tools (E.g. scissors, cutter, screwdriver, 3 d printing).
- State your word count for this section in brackets at the end.

2.0 Comparison to your preliminary design (Maximum 600 words, excluding captions or tables)

- Compare your final design prototype with the chosen preliminary design set by the team.
- Describe the 2 most common issues of your prototype and explain what design changes you have made to overcome these issues.

- Discuss your design limitations and how they can be improved.
- You are expected to utilise neatly snipped CAD images or renders or pictures of the prototype from your own design to support this explanation.
- Prototyping or basic quantitative results may be referenced here to justify your design or estimates of performance, but detailed tests or experiments should be provided in appendices.
- State your word count for this section in brackets at the end.

3.0 Conclusion

As a team, please provide a short conclusion that might include a summary of your report and any additional perspective or feedback on the project or the team itself. This can be a bit more personal. What has it been like working with the team for 12 weeks? Where do you guys go from here? If there is anything else that you would like to tell the teaching staff (as a team) this is also the place to do it. No explicit marks for this, but no word limit either.

Your team report is to be submitted through a Google Drive folder. They are marked based on clarity, good organisation, good use and referencing of appendices, relevant and well-labelled images and significant content. The quality of reports will also be ranked against other group submissions.

- In this assessment, you may use generative artificial intelligence (AI) to generate supporting materials or content in relation to the assessment task.

2 – Final Design Report Engineering Drawings

(*.PDF for formal drawings)

In the report you should reference the file names for your engineering drawings, as shown below. These drawings should NOT be provided in the report itself, they should be submitted separately as ***high resolution PDF files*** (1 per drawing) to your team's Google Drive folder. Please note the required folder and file naming conventions below.

Please try to ensure that each team member provides ONE detail drawing of a different, unique component AND ONE assembly drawing of your device from your own CAD assembly. These drawings will be marked as individual submissions.

Please submit through your team Google drive with the following detail and assembly drawings:

Sub-Folder name:	**Final Design Drawings**
Detail drawing files:	<Student 1 Full Name> Detail.PDF
(Minimum 5 dimensions)	<Student 2 Full Name> Detail.PDF

<Student 3 Full Name> Detail.PDF

<Student 4 Full Name> Detail.PDF

<Student 5 Full Name> Detail.PDF (if applicable)

Assembly drawing file(s): <Student 1 Full Name> Assembly.PDF

<Student 2 Full Name> Assembly.PDF

<Student 3 Full Name> Assembly.PDF

<Student 4 Full Name> Assembly.PDF

<Student 5 Full Name> Assembly.PDF (if applicable)

Note: these files should be the only files in this folder

These drawings are marked based on compliance to AS1100 standards, conventions and best practices taught through the drawing workshops as highlighted in the following:

Detail Drawings:

1. Third angle projection: Views and symbol
2. Titleblock: Neat and complete with Title, Date, Drg. No., appropriate scale, All dim. In mm
3. Tolerances: General Tolerances and special tolerances
4. Dimensioning styles: Arrows pointing to center of arc/circle with correct annotations and neat
5. Sectioning quality: Neat, direction and spacing of hatchlines, threaded parts according to conventions
6. Compliance: PDF, minimum functional dimension of 5 in terms of geometry complexity requirement

Assembly (or Sub-Assembly) Drawings (with a minimum of 5 components included):

1. Titleblock: Complete and neat with Title, Date, Drg. No., appropriate scale.
2. Balloon in clockwise/anti-clockwise, BOM numbering upwards
3. BOM has correct details with Materials & Drg. No linked to other Detail Drawings if it is not a purchased part..
4. Appropriate and sufficiently sectioned views showing multiple components that are held together by fasteners according to AS1100 conventions
5. Centerlines included for all symmetrical and circular geometries

6. Compliance: PDF, the sub-assembly drawings for each student must be unique and none of any 2 assembly/sub-assembly drawings should have identical combination of parts

Sub-Folder name: Final Design CAD

CAD Part and Assembly files: <Student 1 Full Name> CAD.zip

<Student 2 Full Name> CAD.zip

<Student 3 Full Name> CAD.zip

<Student 4 Full Name> CAD.zip

<Student 5 Full Name> CAD.zip (if applicable)

Use the Solidworks "Pack and Go" function (with your entire final assembly open) and select "Save to Zip file" to export a directory of your assembly and all needed part files so that assessors may open your files without missing file errors. Note that the SW assembly file itself does not contain all the part files, it is just the instructions for how they are put together. You cannot reliably copy and paste, or even windows zip these files up and share them without breaking the file associations, you must use Pack-and-Go.

Note: These requested files should be the only files in these folders. Remove any working files.

3 – CAD - Design Fabrication based on Engineering Drawings (6%)

Based on the parts that you have created in the detailed engineering drawing, explain the fabrication process in detail. The process needs to be described in detail from raw material (Eg Ingot, sheet metals, and etc). This process may include any fabrication processes including the fabrication of mould. Note: 3D printing fabrication process cannot be considered for this work as it is typically used for rapid prototyping.

Based on the parts that you have created in the Assembly drawing, explain the assembly process in detail. This process may include a description of how to obtain the parts from its source.

ITP Peer Assessment

A final round of ITP Peer Assessment will be used to moderate marks for respective team submissions. There will be 2 rounds of data collection, once after Prelim Submission and another after Final Submission. Please focus on your teamwork, communication and contributions to ensure that your teammates are impressed with your contribution.

The 1st ITP will be used to factor Preliminary Submission (12%). The 2nd ITP will be used to factor Milestones (5%), Prototype (Competition) (12%) and Final Report (20%).

Students are required to provide detailed feedback for all team members. This feedback will be circulated back to teammates (anonymously) and will help guide moderation by the teaching staff.

Penalties (-10% PAF) may be applied for students who fail to complete ITP or do not leave unique, meaningful comments/feedback. Student who scored 0.7 or lower in ITP will result in Zero for the ITP score.

Financial Support (subject to approval):

As there is little opportunity to provide access to the Project Lab, a budget of RM400 will be allocated to each team to support the cost of purchasing some basic tools and/or materials (RM400 for WARMAN). These amounts will be reimbursed to respective team treasurers for distribution after the semester has ended and teams have competed in the competition.

Assessment Cover Sheet (Malaysia Only)

For all Prelim and Final Report Submissions, you will need to include one Assessment Cover Sheet per person, which can be generated using the following URL format to retrieve your Assessment Cover Sheet:

https://my.monash.edu.au/study/units/**MEC2402**/coversheet

Project FAQ's

Arduino Related	Prototyping Rules	General

Do we have to get the Arduino, electronics and motors ourselves?	Yes, you will need to purchase them online and get it delivered to your house.
What happens if we exceed our initial planned RMXXX budget?	It is your choice to spend as little or as much as you want, no penalty on this Do keep this quote in mind take up the challenge: *"An engineer can do for a dollar what any fool can do for two"* (Arthur Mellen Wellington)
The Arduinos are rather expensive. How	You won't need to buy the original Arduino. A compatible Arduino sold with a cheaper price will work well. Both original and compatible

do we fit the lower budget	versions will still burn if you are careless with swapping the polarity of the power input.
Can I change my project preference after Week 1?	No. Your project preference will need to be honoured throughout the semester once your teams are being formed, subject to the successful application for FSAE (if relevant), SEM (if relevant) or ROBO (if relevant).
I don't know where to start. What should I consider purchasing?	Arduino Uno (or compatibles) + USB cable [~RM30] Motor shield [~RM30] DC motor with wheels (2 sets) [~RM10] Breadboard Battery and battery holder Male-to-male jumper cables DC Plug (Male) to Adapter LED lights/Buzzer as an indicator Ultrasonic sensor Also explore other tabs in https://sites.google.com/monash.edu/monashwarmanwiki/getting-started to get some idea.
Can we buy the obstacle avoidance mobile robot kit from online?	Yes. They are considered as development kits where additional work are required.