ME22007 - Design, Materials and Manufacturing 2

Product Design Activity

Briefing Document

2025

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1 Welcome

Welcome to the Product Design Activity in ME22007 - Design, Materials and Manufacturing 2. This activity is worth 30% of the whole ME22007 unit and it is assessed using 100% coursework.

This briefing document relates only to the Product Design Activity. This document provides useful information on the project brief, schedule, deadlines, submissions, marking criteria and more.

2 Schedule

Please refer to Figure 1 for a detailed schedule. Note, not every week follows the same pattern so check Fig. 1 carefully.

In summary, in-person lectures will take place on Tuesdays and Thursdays in Weeks 15, 16 and 17. The aim is to deliver all content by Week 18,

the inter-semester break. In Week 19, there is an Online Q&A Coursework Clinic on Zoom, giving you the opportunity to ask questions about your submission. All lectures will be recorded and uploaded to Moodle on the day of the lecture. The lecture slides will be available on Moodle on the morning of each lecture.

Studio sessions will occur every Tuesday and Thursday in Weeks 15, 16 and 17. In Weeks 19 and 20, studio sessions are timetabled on Mondays and Tuesdays. Please attend in-person, in your group, and use the time to work on your posters and ask questions to the staff who will be there to support you.

The schedule is summarised in the following table:

Week 15		**Tuesday 7th January**		**Thursday 9th January**
	Lecture:	10.15-11.05 Brief and requirements	Lecture and masterclass:	10.15-13.05 Ideation, evaluation and sketching
	Studio:	11.15-13.05	Studio:	14.15-16.05
Week 16		**Tuesday 14th January**		**Thursday 16th January**
	Lecture:	10.15-11.05 Materials	Lecture (double):	10.15-12.05 Manufacturing
	Studio:	11.15-13.05	Studio:	12.15-14.05
	Optional Draft Poster 1 Submission: Tues 14th January, 4pm (Feedback given by Fri 17th January)			
Week 17		**Tuesday 21st January**		**Thursday 23rd January**
	Lecture:	10.15-11.05 Materials	Lecture (double):	10.15-12.05 Poster 3 and Eco-audit
	Studio:	11.15-13.05	Studio:	12.15-13.05
Week 18	**Inter-semester break**			
Week 19		**Monday 3rd February**		**Tuesday 4th February**
	No lecture		Online Q&A:	10.15-11.05 Online Coursework Clinic
	Studio:	9.15-10.05	Studio:	11.15-13.05
Week 20		**Monday 10th February**		**Tuesday 11th February**
	No lecture		No lecture	
	Studio:	9.15-10.05	Studio:	11.15-13.05
	Final Submission: Thursday 13th February at 4pm			

Figure 1: Schedule for the Product Design Activity

3 Project brief

Each group should choose **ONE** assignment. Choose whichever one you like from the following list:

- **Terry**: Terry is 70 and enjoys the independence that driving brings him. However, he has joint pain and is starting to particularly struggle with getting out of the car unassisted. Terry would like a product that makes getting out of the car easier.

- **Gerry**: Gerry is 80 and loves gardening but he struggles with his mobility – he has joint pain and muscle weakness. It is difficult for him to perform certain gardening tasks such as weeding, which requires grip strength and bending over or kneeling down. Gerry would like a product that makes weeding easier.

- **Berry**: Berry is 67 and enjoys an active, independent lifestyle. She catches the local bus to her town centre a couple of times a week to do her shopping. However, she is starting to struggle with carrying heavy shopping bags around town and on the bus home. Berry would like a product that makes it easier to transport her shopping around town and on the bus.

- **Kerry**: Kerry is 65 and has severe osteoarthritis. She lives in a cottage and while she loves her home, the Council have been unable to convert her bathroom into a wet room. She finds using the shower very difficult. The Council have recently installed a shower seat, allowing her to sit down in the shower. However, she has difficulty lifting herself up, made more difficult by the wet and slippery floor. Kerry would like a product that helps her shower independently.

There are some **constraints** to consider:

- Design a tangible, mechanical product. No software, apps or services. No primarily electrical devices/sensors.

You will work in groups of **four** - please check the Moodle page to find out what your group allocation is. Please email Dr Fallon if you find yourself working in a group of three.

Your final submission will consist of a portfolio of four posters. Poster 1 is concerned with the research and development of a requirements list. Poster 2 is concerned with concept development and concept evaluation. Poster 3 is the opportunity for you to showcase your final proposed concept using CAD. Poster 4 is concerned with material choice, manufacturing route and assessing the environmental impact of your product.

3.1 Use of GenAI

The Product Design Activity has been designated as a **Type B** assignment in terms of the use of GenAI *i.e.* it is permitted (but not mandated) as an assistive tool, to check spelling, language and grammar, and to help as a starting point for ideation. See here for further guidance.

4 Deadlines and deliverables

4.1 Deadlines

There are two deadlines which you should take note of:

- **Tuesday 14th January 2025, 4pm:** Optional DRAFT of Poster 1 submission
- **Thursday 13th February 2025, 4pm:** Final submission to include final versions of Poster 1, Poster 2, Poster 3 and Poster 4

The first submission deadline, on Tuesday 14th January 2025 at 4pm, gives each group the option to submit a DRAFT version of their Poster 1. This submission WILL NOT contribute to your final mark. Brief written feedback will be provided. Dr Fallon will endeavour to post feedback on Moodle for every group by Friday 17th January 2025. We hope that you find the provision of early feedback beneficial.

The final submission deadline, on Thursday 13th February 2025 at 4pm, requires each group to submit the final versions of their four posters (Poster 1, Poster 2, Poster 3 and Poster 4). You will be marked as a group and we will implement peer moderation (see Section 5.1). The marking scheme is presented in Section 5.

4.2 Deliverables

The following section provides details on what to include in each of your posters. All posters shall be A2 in size, with a minimum font size of 14pt. You will submit electronically in PDF format (more details in Section 4.3).

4.2.1 DRAFT Poster 1

A **draft** version of your first poster, Poster 1 should be submitted by Tuesday 14th January 2025 at 4pm. Note, this will not count towards your final mark but is for formative feedback purposes only. Please see below for what to include in Poster 1.

4.2.2 Poster 1

Poster 1 should be submitted, along with your other posters by Thursday 13th February 2025 at 4pm. Poster 1 is concerned with the research and development of a requirements list. Note, the marking scheme we will be using is provided in Section 5. It is suggested that you include the following in Poster 1:

- Research the market
  - People: Can you say anything about your target market? e.g. what % of the population face a certain mobility/dexterity issue?
  - Products: Look at relevant existing products and describe what they do well, and what needs aren't met by existing products.
  - Other considerations? Are there key dimensions, weights, forces etc. to be considered for this product?
  - Could include images, sketches (hand drawn or computer generated acceptable)
- What is your problem statement? (in a sentence)
  - e.g. "Design a device to…", "Design a product that…"
- A full requirements list using EARS
  - Use a similar structure to the one shown in lectures

4.2.3 Poster 2

Poster 2 should be submitted, along with your other posters by Thursday 13th February 2025 at 4pm. Poster 2 is concerned with concept development and concept evaluation. Note, the marking scheme we will be using is provided in Section 5. It is suggested that you include the following in Poster 2:

- Sketches of your final **four** concepts
  - Each group member should sketch one concept
  - Sketches should be hand-drawn (remember, submission is online in PDF format - you will need to take photos or scan in hand-drawn sketches)
  - Good clear descriptions of how the concept works (e.g. labels, storyboarding)
- Concept evaluation
  - Choose either the Pugh's Matrix or MCDA Method to evaluate your concepts using similar templates to the ones in lectures
  - Justify the scores assigned to concepts e.g. by annotating concept sketches with particular strengths/weaknesses or tabulating perceived issues with each concept
  - Brief reflection (a few sentences) on the result of your evaluation, and if this will affect your design

4.2.4 Poster 3

Poster 3 should be submitted, along with your other posters by Thursday 13th February 2025 at 4pm. Poster 3 is the opportunity for you to showcase your final proposed concept. Note, the marking scheme we will be using is provided in Section 5. It is suggested that you include the following in Poster 3:

- What does it look like?
  - CAD renderings are compulsory. Could include a few different views. Communicate the aesthetic value of your product *i.e.* make it look good! Use surfaces and colours where necessary.
- How does it fit together?
  - Sectioned views if you think necessary
  - Exploded views if you think necessary
- How does it work?

  - Labels
  - Explanatory text
  - Could use storyboarding if you think necessary

- Tell us how it meets the users' needs and requirements - convince us it's a good solution to the problem
- Do **NOT** need production/manufacturing drawings
- Do **NOT** need detail on small components e.g. brackets, pins

4.2.5 Poster 4

Poster 4 should be submitted, along with your other posters by Thursday 13th February 2025 at 4pm. Poster 4 is concerned with material choice, material processing route and assessing the environmental impact of your product. Note, the marking scheme we will be using is provided in Section 5. It is suggested that you include the following in Poster 4:

- What material/s and shape/s have you selected for one component of your product?
  - Provide an overview of the process used to select the material.
  - Why have you selected this material and shape? Refer to your requirements, objectives and/or constraints.
- What material processing route have you selected?
  - The primary shaping method for one component is sufficient. Consider trade-offs between design and manufacturing as well as for pre- and post-processing requirements.
  - Why have you selected this manufacturing route? Choose an established or tailored approach to selecting a manufacturing route and explain the relevant assumptions, constraints, and links to the corresponding component requirements. Both quantitative and qualitative arguments are acceptable.
- Reflect on the important issues for your product in reaching zero emissions

- Should assess by the Eco-audit method and can focus on one component only.
- The Eco-audit can be performed using hand calculation or the EduPack software. Details of the calculation do not need to be included on the Poster. However, assumptions, references and the resulting bar charts should be presented.
- What phase of your product life-cycle consumes the most energy and contributes most to CO_2 emissions?
- Could you redesign your product in any way to reduce the environmental impact? You do **NOT** need to actually redesign your product!

4.3 Submission formats

4.3.1 Draft submission of Poster 1

The DRAFT submission of Poster 1 should be uploaded to the relevant submission portal on Moodle (link here). One student per group can perform the upload. It should be uploaded as a PDF document and use the following naming convention:

PD-XX_DRAFT_Poster1.pdf

4.3.2 Final submission of Posters 1-4

The final submission will consist of four PDF documents, one for each poster. Please name each poster according to the following naming convention:

PD-XX_PosterX.pdf

Please place each of the poster PDFs into a .ZIP folder and upload to the relevant submission portal on Moodle (link here). One student per group can perform the upload. The .ZIP folder should take the name:

PD-XX_Final_Submission.zip

5 Marking criteria

The weightings and marking criteria we will be using to assess your posters are presented in Appendix A. A copy is available on Moodle here. You will also receive some specific written feedback.

5.1 Peer moderation process

We will be implementing a formal peer moderation process. Some important points to note are:

- 5% of the total marks available can be re-distributed;
- Each member can score the others on a Likert scale to indicate level of contribution;
- An algorithm, created and authorised by the University of Bath, will automatically calculate and re-distribute marks;
- At least 50% of the group must contribute to the peer review or it will not count (and each member will receive the same mark);
- If 50% or more of the group contribute, but not 100% of group members, the algorithm will take this into account.

The link to the peer moderation portal on Moodle will be available from Monday 10th February 2025 to Monday 17th February 2025 at 4pm.

6 Project communications

6.1 Communications from Staff to Students

- All key information about the Product Design Activity is contained within this briefing document.
- Key content, reminders and other useful information will be delivered in the lectures.
- Course-wide notifications will be circulated via email to avoid any issues with forum subscriptions and alert settings on Moodle.

- If there is a need to contact an individual student or group, this will be done via email.

6.2 Communications from Students to Staff

- **CAD queries:** There is a dedicated Moodle forum for asking for CAD support and this can be found here.
- **All other course-related queries:** These should be directed towards a member of staff during the studio sessions. If you have a query outside of the timetabled slots, please post these to the Moodle Q&A forum here.
- **Late or incomplete submissions:** All requests for mitigation or extension should be directed to the Director of Studies.

Appendix A: Marking Criteria for Product Design

Poster 1 (Weight = 22.5%)

	Emerging	Developing	Secure	Exceeds expectations
Presented targeted research leading to a better understanding of the market?	Some research is presented but it is generic. The research isn't particularly focused on their chosen assignment and/or there is little/no critical assessment of existing products.	Some evidence of research that focuses on their chosen assignment; perhaps there is an assessment of products that already exist. However, the research stops short of quantifying key constraints e.g. dimensions, weights etc.	Research is largely focused on their chosen assignment. There is a critical assessment of products that already exist and what needs aren't being met by these existing products. There is some attempt to quantify relevant constraints e.g. key, dimensions, forces etc.	Extra credit for particularly good research and/or calculations that seek to quantify relevant constraints e.g. key dimensions, forces, weights etc.
Presented a clear and concise problem statement that captures the need at the heart of their chosen assignment?	A problem statement is written but it is quite vague; it isn't specific about the problem they want to solve.	Problem statement is clear and concise though perhaps lacking in some specificity e.g. it is not clear who it is for, where it is to be used etc.	Problem statement is clear, concise and mostly specific, logically following from the research presented.	Extra credit where the problem statement is clear, concise, specific and solution-neutral.
Presented a thoughtful and complete list of requirements?	Requirements are presented but they are quite generic. Not enough, or not specific enough requirements to fully capture what the product must do; lack of quantified statements.	At least 10-15 requirements are presented; perhaps some use quantified statements. However, many are still generic and the list is incomplete; the list hasn't yet fully captured what the product must do.	The requirements list provides a complete summary of what the design must do; any omissions are minor; quantified statements are used wherever it is appropriate.	Extra credit for using EARS correctly and consistently throughout; all other features of a requirements list present e.g. D/W, dates to reflect when changes were made and initials for who made them etc.

Poster 2 (Weight = 22.5%)

	Emerging	Developing	Secure	Exceeds expectations
Produced four, high-quality, hand-drawn sketches of their concepts making it clear how each concept will work?	An attempt to communicate the form and function of their concepts but sketches are significantly lacking clarity and aesthetic appeal.	Sketches are OK but perhaps missing some attention to form and detail; lacking some aesthetic appeal. Some extra effort may be needed to work out exactly how each concept works.	Sketches are high-quality; clearly illustrating the form and detail of their proposed concepts in an aesthetically pleasing way; perhaps additional views have been sketched to clearly illustrate how each concept will work. Little effort or imagination is required by the reader to understand how the concepts work.	Extra credit for particularly good sketches; perhaps colour or shading has been used to enhance the aesthetic appeal; some good engineering judgement displayed in describing how their concepts should work.
Evaluated their concepts leading to a well-justified and reflective proposal for a final design?	An attempt at either the Pugh's matrix or MCDA but significantly flawed in some way e.g. error in the method; very little evidence to justify the assigned scores; little evidence of reflection on the result and how this affects their proposed design.	Overall correct use of either the Pugh's matrix or MCDA; some limited justification of the assigned scores; some limited reflection on the result mentioning implications for their proposed design.	Correct use of the Pugh's matrix or MCDA; good attempt to justify the scores assigned; there is a reflection on the result of the evaluation including a brief discussion of plausible implications for their proposed design.	Extra credit if their reflection shows a well-balanced awareness of the overall performance and potential trade-offs e.g. mention of cost, manufacturability, environmental impact etc.

Poster 3 (Weight = 22.5%)

	Emerging	Developing	Secure	Exceeds expectations
Produced high-quality CAD renders of their final concept, making it clear how the concept will work, leaving little to the imagination?	CAD renders are presented but significantly lacking clarity; it is difficult to understand the form, scale and functionality of their proposed product.	CAD renders are OK but perhaps missing some attention to form, scale and/or functionality. Some extra effort may be needed to work out exactly how the proposed product works.	High-quality CAD renders clearly illustrating the form, scale and functionality. Little effort is required by the reader to understand how the proposed product works.	Extra credit for particularly good CAD renders; photorealistic quality. Some good engineering judgement displayed in describing how the proposed product should work.
Convinced the reader that their final concept is a good solution to their identified real need?	There is some reference to the requirements but it is very limited; flawed or lacking enough detail to convince the reader that the proposed product will actually work.	The proposed concept could plausibly work without fundamental changes needed and is demonstrated to fulfil some requirements, with some detail, but without the coverage or depth to convince that the most important requirements have been met.	Enough detail is presented to convince the reader that the proposed concept is on track to produce a product that will actually work and fulfils the users' most important needs/requirements; there is clear reference to how the proposed product fulfils the key requirements.	Extra credit if the reader feels satisfied that the proposed product is actually a good solution to the real need identified in Poster 1 (and not just the specific requirements they identified).

Poster 4 (Weight = 22.5%)

	Emerging	Developing	Secure	Exceeds expectations
Specified a suitable material and shape for one component of their product and described how and why this was selected?	An attempt to specify a material and/or shape but discussion of its suitability is absent or flawed. No clear approach to the materials selection process has been discussed.	Appropriate choice of material and/or shape but limited discussion as to why it was chosen with reference to some of the design requirements and the chosen material's properties. The materials selection process has been presented but is flawed or unclear.	Appropriate choice of material and shape that has been justified with respect to the most important design requirements and properties of the selected material. Objectives and constraints have been considered and used to guide an appropriate selection process. The materials selection process is clear and logical.	Extra credit if the appropriate choice of material and shape is supported by a comprehensive consideration of objectives, constraints, and calculations. The validity of material and shape choice is justified and quantified, where necessary, against all of the relevant design requirements. The materials selection process is logical and has clearly facilitated an effective material choice.
Specified a suitable manufacturing route and described how and why this was selected, for one component of their product?	An attempt to specify a manufacturing route but discussion of the suitability is absent or flawed.	Appropriate choice of manufacturing route specified but limited discussion as to why this was chosen with reference to the product requirements. Lacking methodology explanation behind the choice.	Appropriate choice of manufacturing route specified; justified by discussing some relevant requirements of the specific component and their overall priorities and requirements. Clear explanation of relevant selection methodology and of relevant assumptions.	Extra credit if quantitative metrics are developed or if reasonable alternative processes are provided with robust arguments.

Thoughtfully reflected on the important issues for their product in reaching zero emissions, including answering what phase of their product's lifecycle consumes most energy and contributes most to CO_2 emissions?	Some reflection about which phase of their product's lifecycle consumes most energy and contributes most to CO_2 emissions but little evidence provided to back this up; an attempt at the Eco-audit but significantly flawed in some way or missing key details.	Answered what phase of their product's lifecycle consumes most energy and contributes most to CO_2 emissions; some evidence provided to back this up in the form of an Eco-audit but perhaps missing some detail e.g. Eco-audit assumptions not clearly stated. Plausible steps for improving the environmental impact are mentioned.	Answered what phase of their product's lifecycle consumes most energy and contributes most to CO_2 emissions; clear evidence provided to back this up in the form of an Eco-audit with clearly stated sensible assumptions. Plausible steps for improving the environmental impact are discussed.	Extra credit if their reflection shows a well-balanced awareness of the wider issues and potential trade-offs.

Overall poster portfolio (Weight = 10%)

	Emerging	**Developing**	**Secure**	**Exceeds expectations**
Produced a high-quality set of posters?	Significant flaws in formatting or presentation that impact on the reader's ability to understand and assess.	The poster presentation and formatting is lacking aesthetic appeal and/or attention to detail in several places (e.g. missing references), but this does not significantly impact the reader's ability to understand it.	The poster presentation and formatting are generally clear and aesthetically pleasing. The obvious uses of tables/figures/sketches /annotations have been made rather than using lengthy prose.	The posters are presented to a high standard. They display creative flair and are aesthetically pleasing, and/or are highly functional, with good use of formatting to guide the reader through each poster.