Design Week:

Assessing a module in 5 days; explained in 5 minutes

15

Dr Idris Kevin Mohammed
Senior Teaching Fellow
Department of Mechanical Engineering

What is Design Week ?

Design Week is a project-based activity for Year 2 Mechanical Engineering students in the Spring term that serves as their exam

Objective: To experience an entire design process, as a team, in one week, from 'initial idea' to 'engineering delivery'

The students have (almost) complete design freedom:

We expect the students to use all their knowledge from modules AND to be creative, curious, search information independently, communicate, conclude, collaborate → **be an engineer.**

Close simulation of the real-life design practice

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Close simulation of the real-life design practice

The scenario for Design Week

You [the student] are part of an engineering design consultancy firm.

Four companies contacted you to execute an idea they recently proposed. They expect a fully developed concept by next Friday.

You can deliver only one project:

- *Portable device that can **flip a coin***
- ***Motorised nut splitter** to break nuts off bolts*
- *Battery-operated device that can **clean paintbrushes***
- ***Wine cooler** which cools liquid from the bottle the glass*

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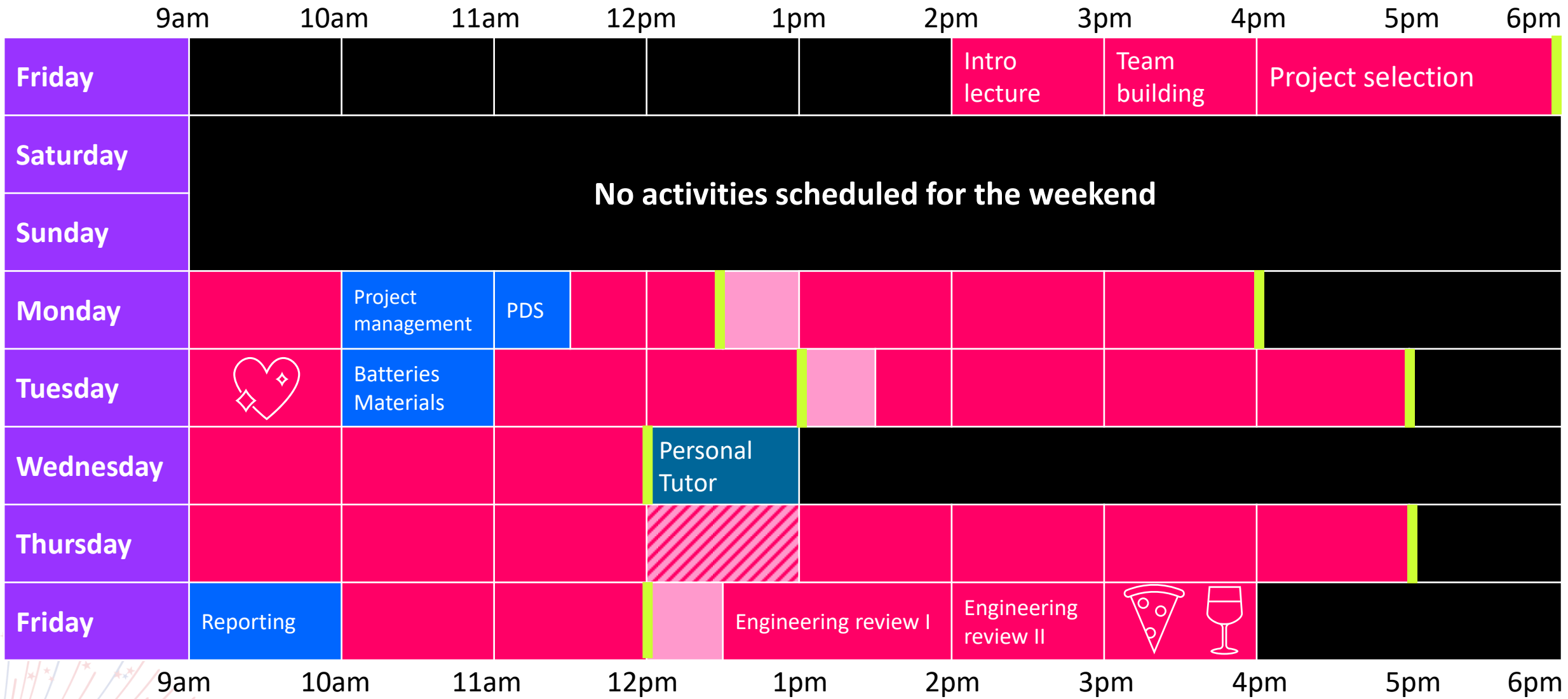
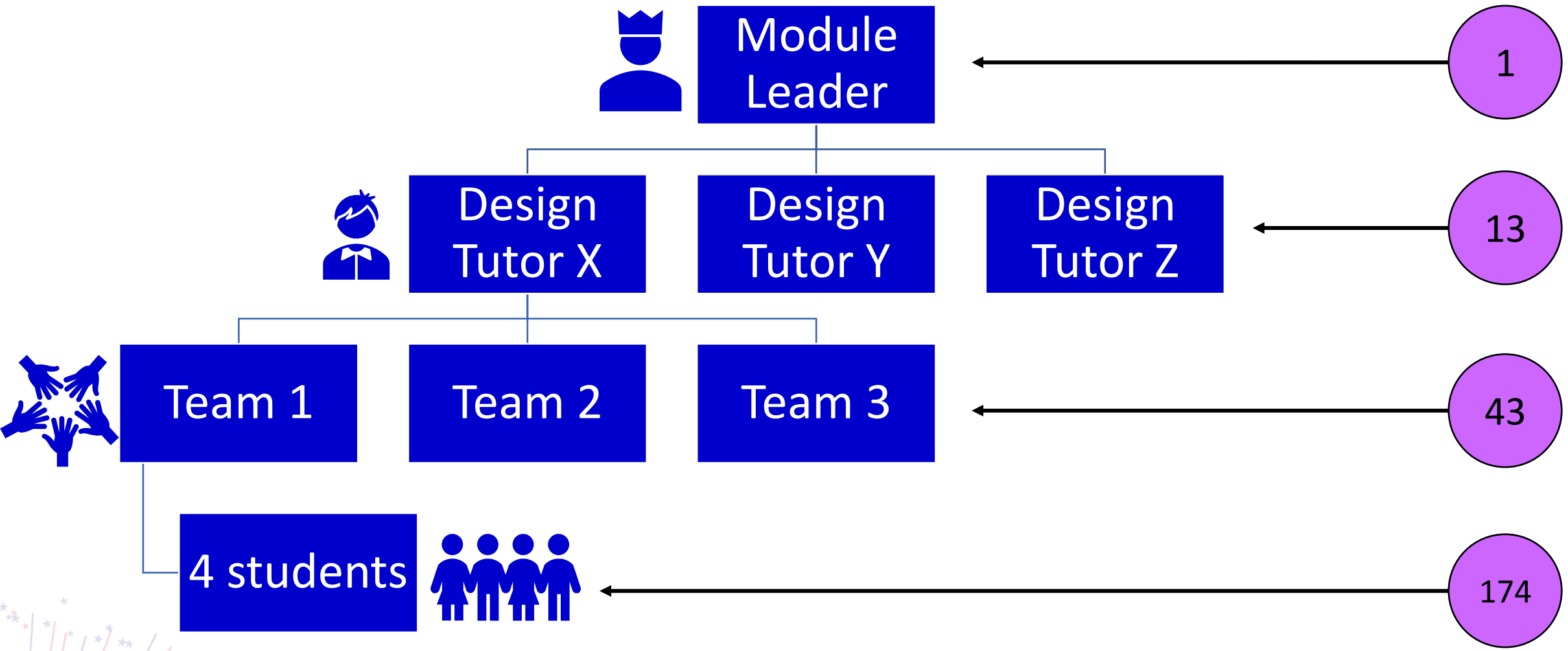
Timeline of the week



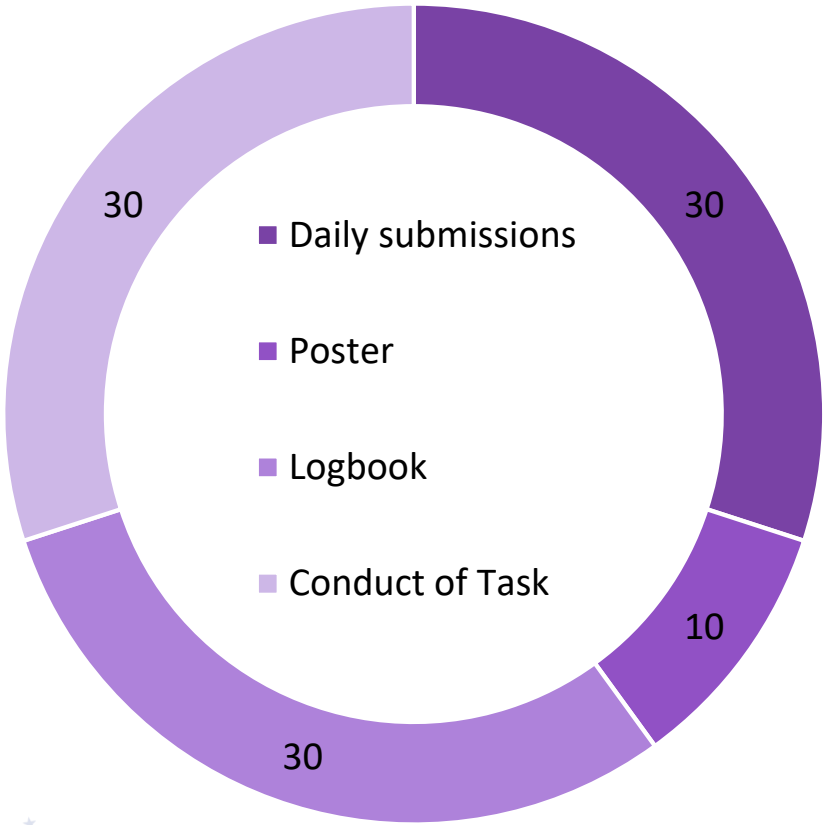
IMPERIAL
Festival of Learning and Teaching 2024

Daily hand-in | Design Week | Seminar | Lunch break | Nothing

Structure


Module Leader
1
Design Tutor X
Design Tutor Y
Design Tutor Z
13
Team 1
Team 2
Team 3
43
4 students
174

Assessment



Daily submissions [group] (30%):

Daily slides templates provided which are then compiled at end of week

The slide deck is presented to the Design Tutor and graded

All 48 slide decks are independently marked by me

Logbook [individual] (30%):

The logbook is a record of process and development

It is marked and second marked by GTAs

Poster [group] (10%):

Posters are printed in A1 size and displayed at an exhibition

It is marked by the Design Tutor and a Postdoc

Conduct of Task [individual] (30%):

A mark awarded by the Tutor to rate the performance of each team member based on how well they contributed to the team and the project

The mark is scaled based on peer-assessment score

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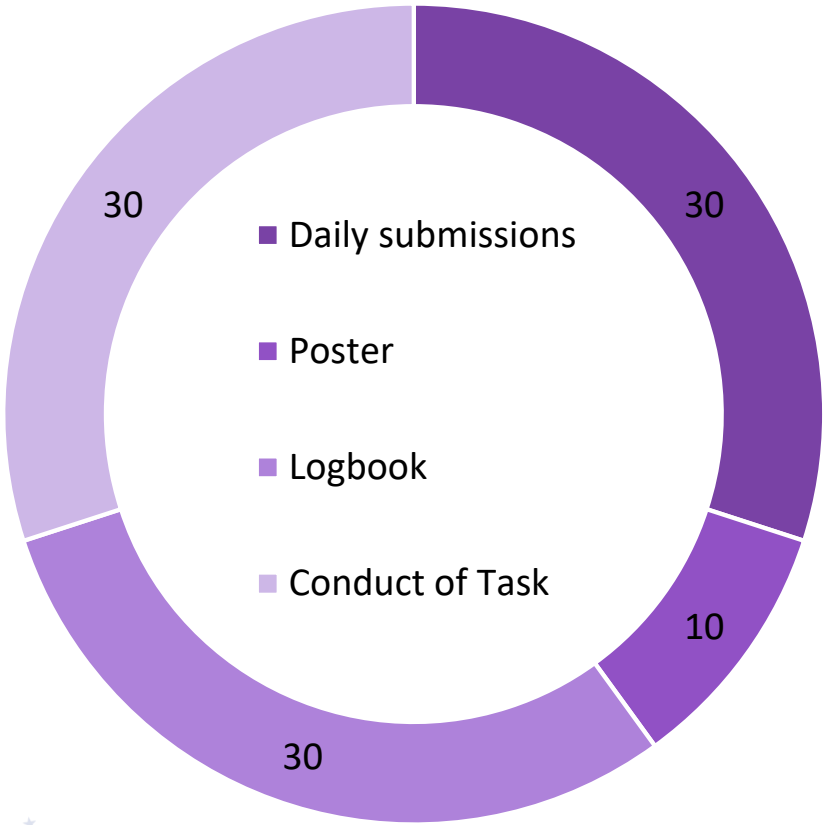
Technical Assessment



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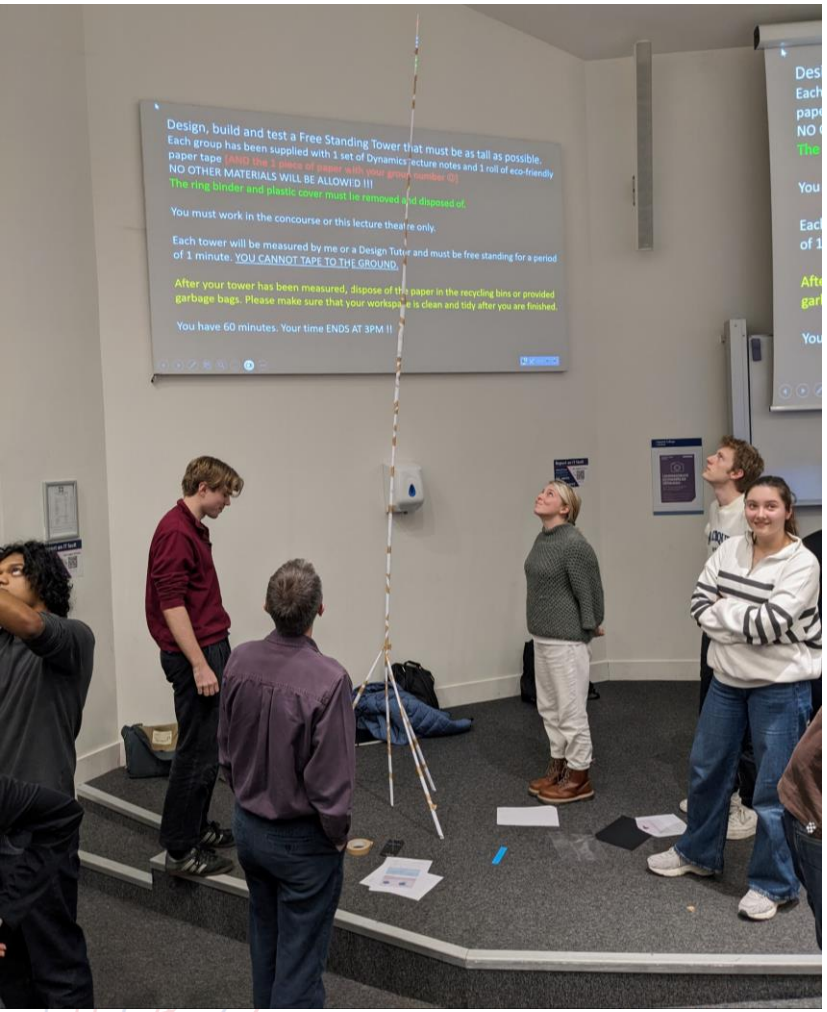
Presentation Criteria



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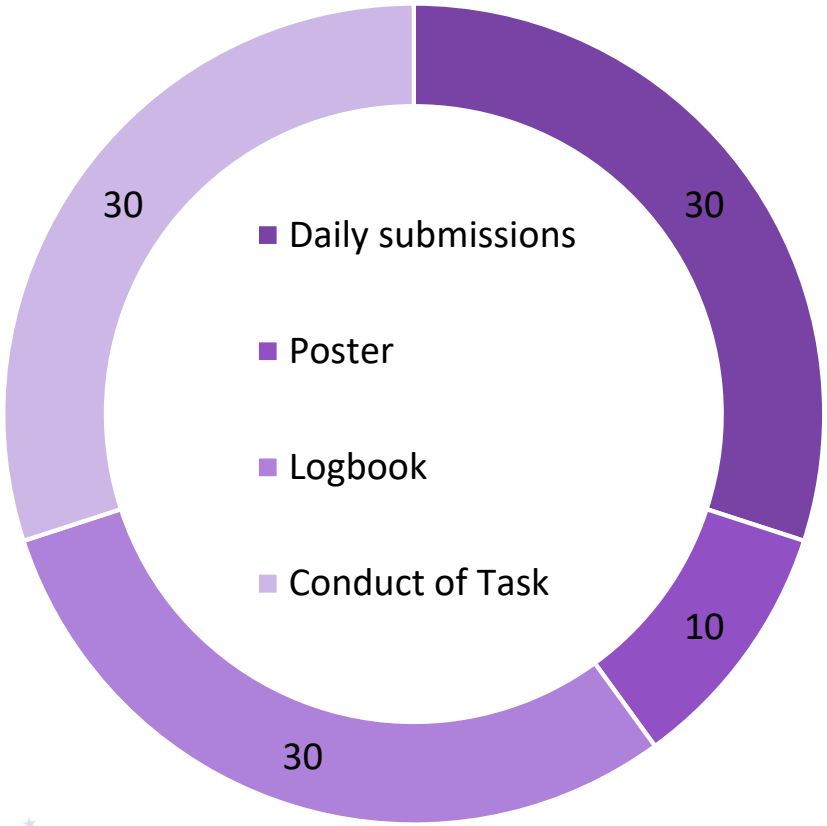
Design Tutor						Design Week Group Number				
Quality of slides										
0	1	2	3	4	5	6	**7**	8	9	10
Time Keeping										
0	1	2	3	4	**5**	6	7	8	9	10
Clarity of communication										
0	1	2	3	4	5	6	7	**8**	9	10
Student questions										
0	1	2	3	4	5	6	7	**8**	9	10
Design justification										
0	1	2	3	4	5	6	7	8	9	10
Explanation of how it works										
0	1	2	3	4	**5**	6	7	8	9	10
Technical analysis										
0	1	2	3	4	5	**6**	7	8	9	10
Manufacturing considerations										
0	1	2	3	4	5	6	7	**8**	9	10
Feasibility										
0	1	2	3	4	5	6	**7**	8	9	10
Summary										
0	1	2	**3**	4	5	6	7	8	9	10
COMMENTS:										

Logbook Assessment



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Fun fact: The students are instructed to self-assess their own logbooks !!!

Logbook Criteria

1. **CONTENT**
   - Background information; aims & objectives
   - Research notes; including authors, titles etc. of important references encountered
   - Design sketches/equipment details/annotated photos
   - Product design specification (PDS)/research hypothesis
   - Evidence of process/methods used, including alternatives considered; design iterations
   - Key design/technical decisions with justification
   - Results/plots and analysis (record of where results are stored, file names etc, if appropriate)
   - Interpretation/consideration of significance of results (including errors/tolerances)

almost nothing E D C B A *complete and valuable record of activity*

2. **PROJECT ORGANIZATION**
   - Meeting notes and feedback commentary
   - Action items and reflections, contiguous record
   - Key project management decisions with justification
   - Reviews and evaluation of progress
   - Reflection on daily task and deliverables

occasional entries E D C B A *clear diary of activity throughout project*

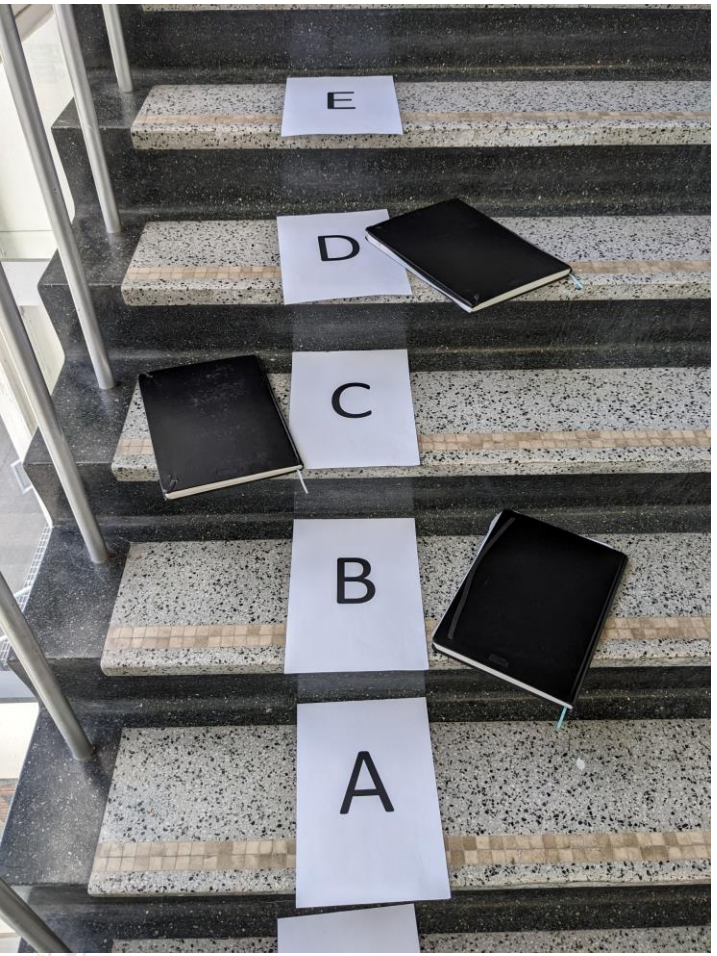
3. **CLARITY OF COMMUNICATION**
   - Entries dated and brief title of activity given on each page
   - Reasonably legible
   - Annotations on sketches/photos/plots as appropriate for understanding
   - Easy to navigate by outside observer (may include table of contents/page numbers)
   - All additions secured (no loose pieces of paper)
   - Reverse engineer-ability ie. if the project was to be continued beyond your involvement

a complete mess E D C B A *neat, clearly written document*

These factors are unweighted and should not be summed, but their mode should help guide you towards a suitable mark. Note that a good logbook should be B. Grade A means a log book of the type you wish your PhD students (or you) kept. (A ≥ 70% > B ≥ 60% > C ≥ 50% > D ≥ 40% > E)

If the logbook is not a continuous record, then the mark should be adjusted to reflect this. For example, a very good logbook kept for half of the duration of a project could only score max 50%.

Logbook Feedback



Example Logbook Feedback:

Clear assignment of roles within the team. To improve, consider adding more detail about individual responsibilities each role may entail. It isn't clear what research you did to inform your PDS; please justify the choices you made! Very good calculations. However, don't forget to state your nomenclature to make them easier to understand and follow. Not always clear where you get certain numbers/values from. For example, you mention the price of carbon steel but then don't reference where you got this price from. Well done for mentioning and justifying a safety factor in you shaft calculations. To improve, consider mentioning tolerancing, and if tolerancing is not required then justify this. Don't forget to note down where you and your teammates have saved certain documents, Python scripts etc. Make sure to always take down notes from internal team meetings; these team meetings should involve reflecting and evaluating your progress. It isn't always clear what the actionable items for the day are and who these tasks are assigned to; you mention your team mates once or twice but try to be more consistent. I should be able to read these from your logbook and then find the corresponding work in your teammate's logbook. For example, any graphs used to justify design choices should have been printed and added to your book or referenced that it was in someone else's logbook. Well done for labelling pages with clear headings. However, please date and number all your pages as well as adding a contents page; this is helpful for you and anyone else looking back at your work. Good use of clear and well-annotated images. To improve make sure you are consistent in justifying your choices based on these annotations. Overall, an acceptable logbook with some well-annotated sketches. To improve, try to make it clearer what you and your team's thought process is and always justify your choices in a clear manner. For example, it is unclear what concepts were proposed by the team, which concept was picked as your final design and why it was picked.

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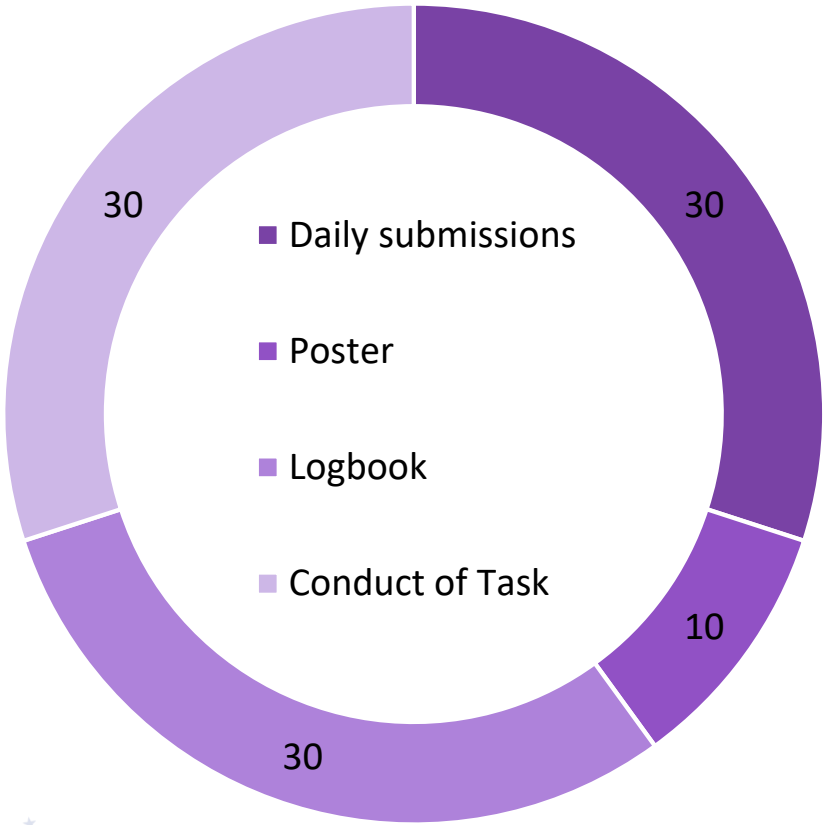
Poster Assessment



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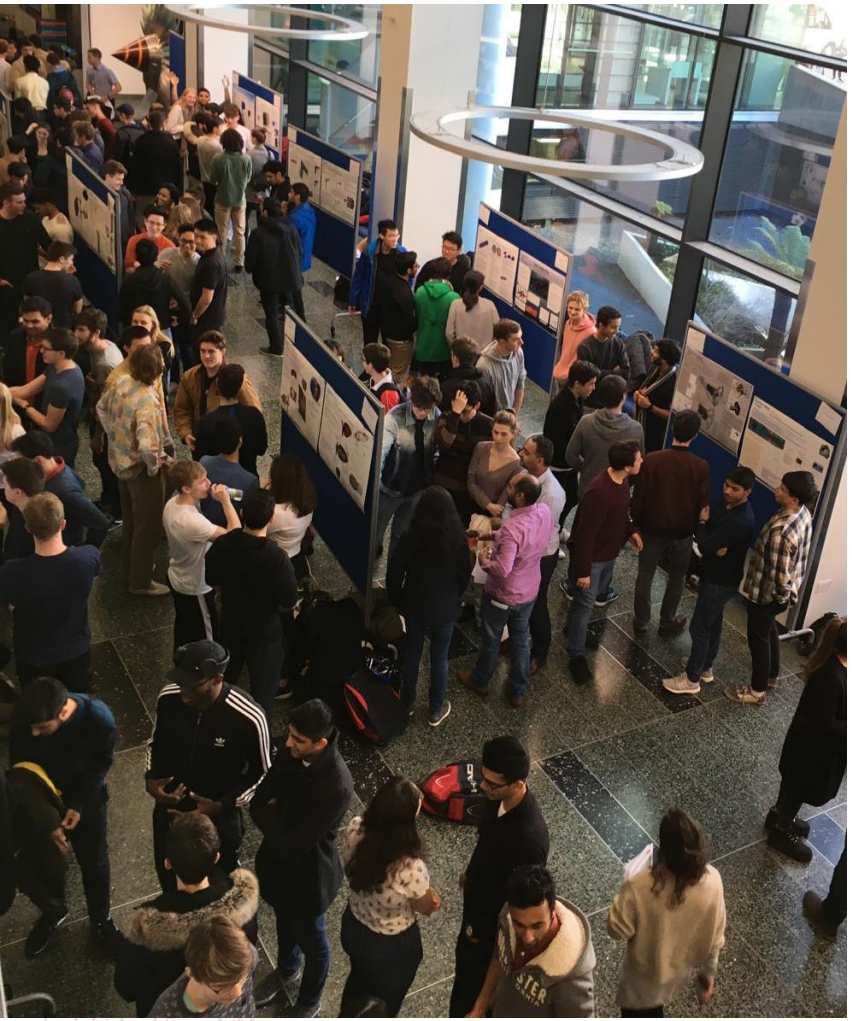
Fun fact: The poster task is released at 9am and submitted 3 hours later !!!

Poster Criteria



1. POSTER APPEARANCE

- Title, layout, font
- Quality of English
- Structure and presentation
- Quality and use of images/graphics

Disorganised, unclear E D C B A *clear, organised*

2. DESIGN CONTENT

- Functional and operational specification / description
- Justification

trivial E D C B A *excellent, well above expected*

3. ENGINEERING CONTENT

- Analysis of performance
- Mitigation of failure
- Annotations and explanations

very little E D C B A *comprehensive*

4. ORAL DELIVERY / PRESENTATION

- Engagement
- Ability to clarify and answer questions

very little E D C B A *excellent, well above expected*

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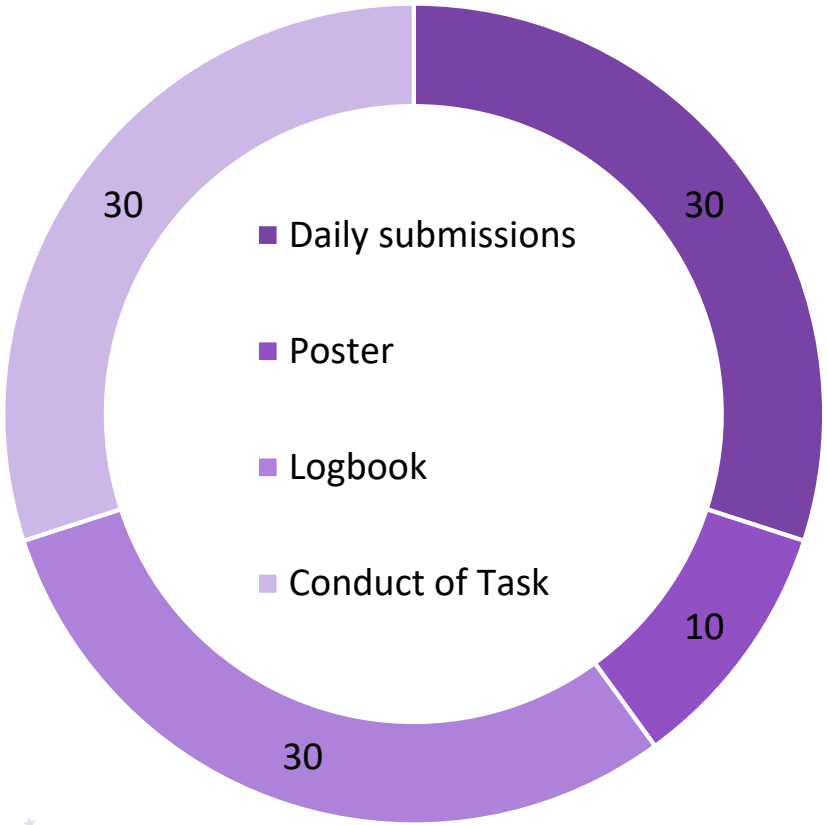
Conduct of Task



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Tutor Criteria

1. EFFECTIVENESS

- Ability to work a part of a team
- Contribution to the smooth running of the project
- Motivation

disorganised E D C B A *efficient*

2. QUALITY OF WORK

- Independence of thought (does this student just do what they are told?)
- Ability to give and take advice

trivial E D C B A *excellent, well above expected*

3. QUANTITY OF WORK

- Engagement with the project
- Time and effort put into the project
- Active participation in meetings

very little E D C B A *comprehensive*

4. UNDERSTANDING SHOWN

- Willingness to learn and apply new knowledge

very little E D C B A *excellent, well above expected*

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Peer Assessment

$$Group\ Contribution\ Factor_1 = \sqrt{\frac{x_1}{x_{avg}}}$$

Group engagement: *how student engaged in and with the group.*
Engagement might be through discussion in online and in person meetings (including verbal contributions, body language, taking shared notes, etc.), through online/asynchronous interaction (including emails, whatsapp/messenger services, participation in live online documentation, etc.)

Technical contribution: *how the student added to the deliverables and process of the engineering.*
Technical contribution may be through the creation, curation and development of technical documentation such as drawings, write ups, CAD models etc. It could also be through the engineering processes leading to the deliverables such as research, calculations, ideation, problem solving, etc.

Project contribution: *how the student added to the deliverables and process of the project.*
Project contribution may be through project planning such as Gantt chart creation and maintenance, meeting planning, chairing and minuting. Ensuring deadlines, gateways and reviews are arranged and delivered smoothly. It could also be through quality control activities such as document control, proof reading, formatting etc.

Support for others: *how the student played a supporting role in group activity.*
Support for others can be apparent in a huge range of ways. Examples include: advocating for process change to ensure everyone has the opportunity to contribute in or chair meetings, showing others how to use software, identifying where team members may be at risk of scoring badly in peer assessment and developing ways for them to contribute in ways they are able, mediating between different aspirations and abilities to ensure positive outcomes for all.

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Results

A* – 0

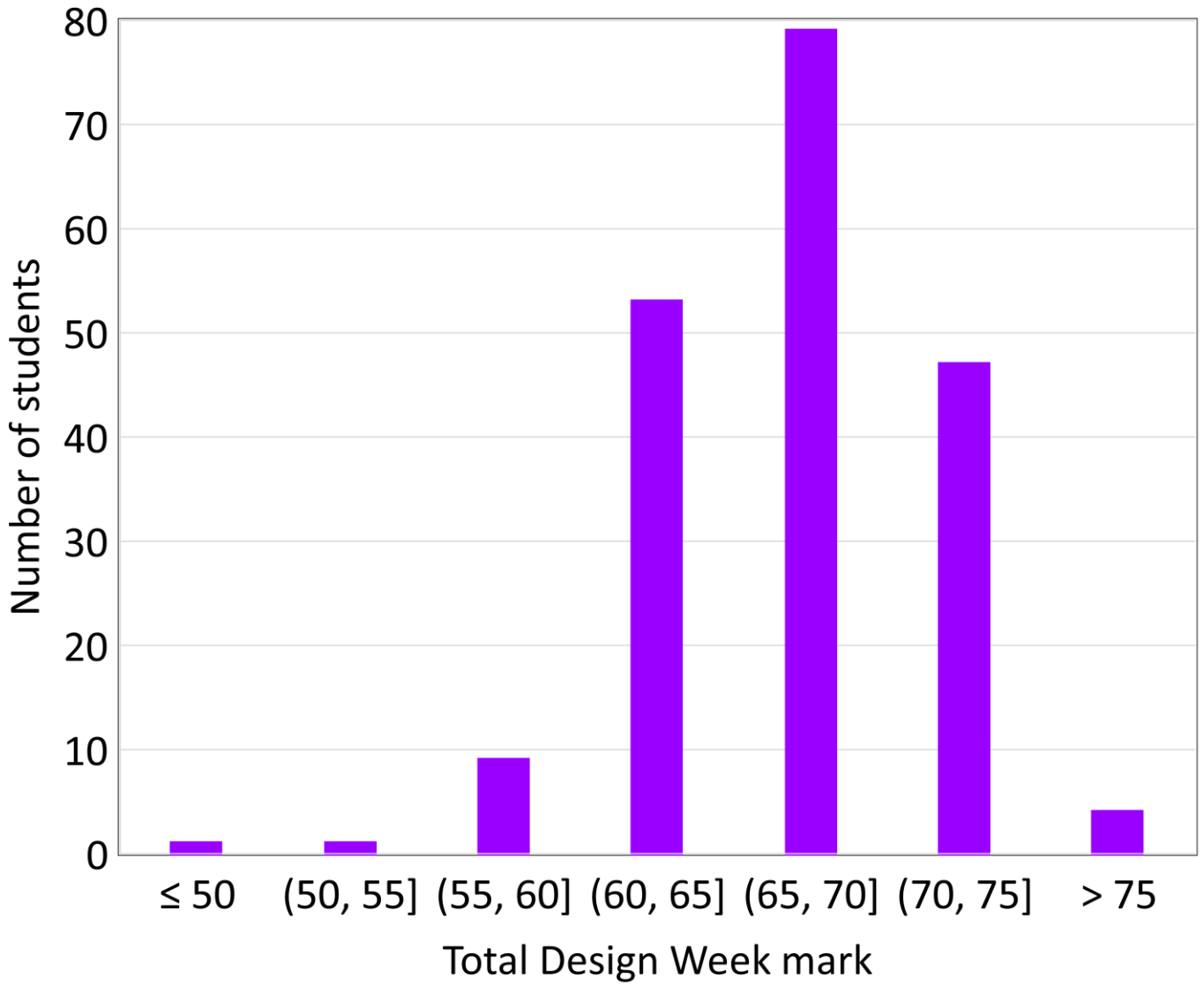
A – 51

B – 132

C – 10

D – 1

E – 0



Conclusions (?)

What can be done to spread the marks ?

How relevant are physical logbooks ?

Is 2 hours of contact time enough to give a ‘Conduct of task’ grade ?

Does ‘Design Week’ accomplish its aim ? ⟵ YES ☺