

Coursework brief: Group Design and Make Exercise

Design Project - I (DES602) Post Mid-Term Assignment - 2 (15%)

Introduction

The Conceptual Design exercise of an extraterrestrial tool prior to mid-term had focused your learning on most of the discovery and definition phases of the double diamond model.

Post mid-term, your focus will slowly shift further into the development and delivery phases.

You will be applying the design process and your materials knowledge to improve a selected product with respect to the following aspects in greater detail:

- Materials,
- Usability,
- Geometry,
- Function,
- Performance,
- Reliability,
- Quality,
- Sustainability,
- Assembly,
- Disassembly,
- and Aesthetics.

The deadline of this assignment is 6th April, 2025. You will be submitting a 10 min video/ppt presentation with each member of your group on HelloITK and time permitting, via Zoom/Microsoft teams or physically in the Labs. The presentation should aim at detailing and explaining the process you followed to achieve your tasks. This should be accommodated by PowerPoint slides for the running duration.

Important Notes:

- **You may NOT choose a mains power product – unless runs on low voltage (3.3 – 24 volts) via a mains power transformer such as a USB charger**

Assignment Tasks

You are required to work in a group of 5-10 people to achieve all the tasks. The groups were already formed pre mid-sem. Information on your group members can be found on HelloITK.

1. Identify a relevant and suitable household item or common product that you are all interested in.
 - a. You have a budget of Rs. 500 if you decide to buy a product for design review/analysis allocated from the institute. So, you will need to plan how you will spend your budget and document your plan and intention in this section.
 - b. Brainstorm each of your group members preferred product interests and why. Use a scoring method to select one final product that you all wish to work on as a group over the duration of the project.
 - c. This must be approved by me in the week commencing 17th March at the latest.
 - d. Your first task having purchased your product is to identify and evaluate the design functions in your team, and user requirements of the product as it stands. Use plenty of photographs to complete this task and ensure each member contributes to

this section. You may decide to hand over the product to other members of the team on a rotational basis.

2. Disassemble the product in order to evaluate and identify the design improvements you want to achieve by the end of the project.
 - a. To do this you will need to allocate a budget (which is part of the Rs. 500 allowance per group) for any tools you will need to take the product apart bearing in mind how you will be putting it back together later.
 - b. Use plenty of photographic evidence to produce an overview of the product, and the current bill of materials (BOMs) of your product. The BOM should include name of component, its function, photos, materials used, manufacturing processes used, quantity, and a general description. If you are unsure of a material have a look at the symbol it carries, or other methods that could help you guess what the material is. Ensure you justify any reasoning for this aspect.
 - c. Document the BOM in a table for reviewing it to your instructor in a methodical way which means documenting the process with brief sketches of how the pieces fit together and where necessary, use photos. Identify the tools used and any special jigs or fixtures that helped the manufacturer build the product, but also helped you disassemble the product and document this process.
 - d. Brainstorm the problems and ideas you have with each member of the group and note at least three main improvement approaches that your group could select. Carry out a benefit analysis on the three in order to justify a selection of one direction. In each approach, you should have at least identified 5 worthy improvements that could make up an adequate project and select one or two which you intend to do in your final selection.
3. Design an improved product, bearing in mind a budget limit of Rs. 500 for each Design & Make (DM) group. This will be allocated to you by the school department. For any payments to be reimbursed, you must keep all the receipts and one group member puts in the claim expense form once the product and equipment are purchased ASAP.
 - a. Identify other materials and machine elements you may need to add (such as electronics, electrical, brackets plates, angle brackets and screws, etc.) that can be bought and used for prototyping within the budget limit.
 - b. Produce your proposed improvements as sketches and get them approved by the lecturers.
 - c. Use SolidWorks/sketches/ and visual communication pieces to show how your improvements could be designed.
 - d. Select your final design and ensure it is viable, and feasible to design given the time constraints you are aware of, in order to model and potentially test it.
4. Produce a Detailed Design of the selected redesign concept of the device in the form of detailed 2D/3D drawings of your device. The 2D/3D drawings should be detailed enough to produce new components/part by hand or 3D printing and with build instructions.
 - a. There will be several challenging questions aimed to test your knowledge of the improvements you designed for your new device: (1) Product Function, Performance and Operation (Reliability, Quality, Working Principles); and (2) Structural strength and stability (i.e. how will it be held together, manufacturing processes etc.); (3) Aesthetics, i.e. does it appease the eye and appeal to its users?
 - b. The construction materials for the main redesigned structural element(s) should be either Wood, Metal and/or Plastics with an option of featuring electronics. You should aim to produce at least one low fidelity prototype of the entire device, or 3

smaller aspects of it over the duration of the project. Note: these prototypes will be produced in the design workshop labs so ensure you have budgeted in the equipment you may need out of the allocated budget.

5. Build your low fidelity prototype models and evaluate them. Present the process and steps of building and testing your design if it were a final production unit.
 - a. When working on this stage, document the amended assembly/disassembly method and comment on the actual improvements limitations and weaknesses you discovered against what you initially had in mind as an ideal improvement. Will the improvement be successful? How will you commercialise it? How will you promote the unique aspects of the improvements to your users? (Your improvement may be quite simple but should reflect a sound engineering approach)
 - b. Document your analysis/evaluation findings from each member of your group.
 - c. Each group will be required to do present the group presentation. The judges will provide feedback on the content and group member participation will be assessed via peer review process in due course.
 - d. Make sure you identify how will you (1) Safety Test, (2) Function Test, and (3) Evaluation of the Structural Strength, Stability, Aesthetics and Ergonomics of your proposed product. Marks will be given to the groups that considered (1) a safe device; (2) that will function accordingly; and (3) and was aesthetically pleasing and ergonomically operable whilst demonstrating the required strength and stability in the design.
 - e. You may wish to create a promotional poster of your final rendered design to bring it as close to reality as possible if you could not produce any fully functioning prototypes.

Marking scheme for the group project (<i>Design and Make Exercise</i>)	WEIGHT
Analyse and Evaluate the product	5%
Identify initial improvement(s)	10%
Disassembly of the product	10%
Examination of the product	5%
Develop the Redesign Concepts for a device	15%
Select the optimal or the best Redesign Concept using a suitable design evaluation and selection process	10%
Produce a Detailed Design	15%
Prototype Approach (Physical product)	10%
10 slide ppt and video/ppt presentation	20%

The deliverables are the following:

- Presentation with voiceover detailing the original and final product with details of the design process used, bills of materials, function structures, new features, etc. (Submit on HelloITK and a presentation in person, time permitting)
- Physical product (Submit in person in the design department with group name, team members name, product name tagged to your submission)
- Digital models and data corresponding to the solution concept (Submit on HelloITK)

For the students who are more ambitious and think they have developed something unique and patentable, you can liaise with the course instructor to get a patent concept approved and an Intellectual Property Disclosure Form (IPDF) submitted as an additional deliverable. The IPDF must be duly signed by the instructor and all group members as co-inventors. Bonus marks (5%) are allocated for groups who are able to do this.

Good Luck and please stay safe !

Amar Behera