## ENG 142 FUNDAMENTALS OF ENGINEERING DESIGN

## TERM DESIGN PROJECT

### Fall 2014

**Background**

You are part of a team of graduating engineering students who are forming a company to develop novel assistive devices. You would like to develop products that can help people with physical disabilities and injuries perform everyday tasks.

**Project Description**

Your team will design a product or device that will enable a person to perform a task with one hand that would normally require two hands. The product must be new to the market (i.e. does not currently exist such as a touchless soap dispenser or a one-handed jar opener). You will follow the design process in the formulation of your product, from problem definition through testing and demonstration of a working prototype. All steps should be well documented and will be kept in a project logbook, which will be graded at the end of the semester.

Each team is responsible for purchasing the materials necessary to build the prototype, so size and cost should be kept in mind. Excessively large and complicated devices tend to be more expensive, as well as difficult to successfully construct. The device can be purely mechanically based or contain small motors/sensors; however, complexity and cost should be kept in mind. The total cost of materials for constructing the device should not exceed $50.

**Team Formation and Company Charter**

You have already been assigned to a team consisting of 3-4 students. This team represents your new “company”. Your first task will be to develop a name for the company, a company logo, and a mission statement (all prepared on computer if possible).

**Project Requirements and Due Dates**

***A.*** Project Proposal

Each team is required to consider three possible design options and select the one they feel will most successfully complete the task. This process represents Phase I – Design Problem Definition and Phase II- Engineering Analysis, of the design process. At the end of this design stage the teams will prepare the following:

1. A written proposal which should be approximately 2-4 pages in length and include:

* Problem statement and need
* Description of all performance criteria, engineering, and realistic constraints
* Summary of the brainstorming process, which should include a description of three possible designs with accompanying sketches
* Analysis for determining optimal design (decision matrices, calculations, etc)
* Final design selected
* Project planning (project schedule for semester, work breakdown, budget)

1. PowerPoint presentation of the proposal. Presentations will be evaluated by the instructor and attending students (see presentation evaluation form).

***B.*** Design Report

Each team must prepare a well organized technical report that describes and justifies their design.

Report components:

1. Title page with project title, company name/logo, team member names, date
2. Table of contents
3. Abstract: A brief, but complete, overview of the project (250 word limit).
4. Introduction: Present need and problem statement, background research, design and realistic constraints.
5. Engineering Analysis: Describe the three possible design solutions, optimal solution and justification for the optimal selection (decision matrices, calculations, graphs, or other appropriate analysis).
6. Prototype Development and Testing: Describe construction process, system testing, achieved results and recommendations for improving the design. Also describe any changes made to the design as a result of the construction or testing process. Present additional drawings if changes were significant.
7. Project Planning: Present final project schedule, budget, and team interaction (team roles, problems or conflicts which arose and how they were dealt with, scheduling delays if applicable).
8. Conclusions: A short summary, restate why the work was done and how it was done, what you learned from the process and provide a conclusion to the work. Also state whether all of the criteria and constraints for the project were met and reasons if they were not.
9. References: All sources of information should be provided in a bibliographic form.
10. Appendices: create appendices for at least the following: plans, proposal (including PowerPoint).

***C.*** Plans

A scaled and properly dimensioned orthographic sketch of your final design must be created showing front view, top view and side view. The sketch should include a border and a title strip. Plan should be attached to the report as an appendix. Additionally, prepare a parts list as a separate plan. Freehand drawings (i.e. not using a ruler), will receive zero credit. Alternatively, CAD software may be used.

***D.*** Construction and Testing of Prototype

A working prototype of the final design must be created. The intent is to show what the final product or device looks like and that it functions according to its design specifications. Suitable materials may be used in its construction, even if they would not be used for mass production (e.g. using wood instead of a plastic or metal to reduce cost and enable easier manufacturing).

***E.*** Project Planning Documentation

Each team is required to maintain a project logbook. The logbook will contain sections pertaining to project management (meeting minutes, action items, schedule tracking, etc), design concepts and analysis/calculations, drawings/plans, construction (materials, methods), and testing activities. Logbooks will need to be brought in to every class. Instructor will periodically collect and review logbooks. The reviews will not be announced.

***F.*** Presentation of final designs

All ENG142 sections will present their designs at the Freshman Design Showcase, which will be attended by all students in ENG142, as well as other engineering students, faculty, and the Dean. Each team will create a poster which summarizes the main features of their product, as well as include other relevant information regarding its design, testing, and performance (poster formats will be discussed later in the semester). Demonstrations and poster presentations will also be given in the class preceding the Design Showcase, where they will be evaluated by the instructor.

Due dates are as follows:

|  |  |
| --- | --- |
| Deliverable | Due Date |
| Company Charter | September 15 |
| Project Proposal | October 16 |
| Oral presentations of proposals | October 16 |
| In-class demonstration and poster presentation | November 17 |
| Freshman Design Showcase and Awards (Final demonstration and poster presentation) | November 19 |
| Final Design Report | December 1 |

**Team Grading**

Each project will be assigned a single team grade, which is based on: quality of all required submitted elements, quality and demonstration of working prototype, completion, and team effort. Peer evaluations will be conducted at the end of the semester. Students will evaluate the contribution and performance of each team member on their team including themselves. A peer evaluation factor will be determined within a range of 0 to 1, which will be used to adjust the final individual design project grade.

Grade breakdown is shown in the following table. Each category is graded out of 100 points.

|  |  |
| --- | --- |
| Deliverable | Weight % |
| Company Charter | 5 |
| Project Proposal | 10 |
| Oral presentations of proposals | 10 |
| Demonstration of working prototype | 20 |
| Design Plans | 15 |
| Final Design Report | 20 |
| Project Logbook | 20 |