INSE 6411: Final Design Project – Winter 2019

(30% of final grade)

- ***Objective***
  - Final project allows you to apply the material you learnt in the class in a real project. You are required to design a product of your choice and to provide the description and/or the documentation related to the design and development process.

- ***The product:***
  - You can select any product you want to design, but it is recommended to select something the team members like and know well. The product should be original and not already existing (please, check Google)! We can discuss the suitability of the product, but your team is responsible for selecting a product whose design is feasible given the constraints of the course and the requirements for this project. You should design a product which would allow you to address all the required items. If some items are not well addressed you will lose points.

- ***Teams:***
  - Projects are carried out in groups of **max 4 students.** The teams should be formed during the first introductory lecture of the project.

- ***Project proposal***
  - Project proposal is a document of max 1 page including the names of the members of your group, tentative title and a brief description of the product is due on February 5th. Please, submit a hard copy during the lecture. Later submissions will be penalized.

- ***Project presentations:***
  - Presentations of your projects will be held on April 9th during the class.
  - All students must be present and take part in the presentation of their team (everybody has to speak) and must be able to answer all the questions related to any part of the project. Individual evaluation may be given for your answers.
  - You do not need to submit your ppt slides.
  - The presentation should take 20 min, longer or shorter presentations will be penalized.
  - The presentation should summarize all your work while highlighting the most important points. Do not include any theory slides in your presentation! Focus exclusively on your product, especially on the critical and interesting points. You may not have time to show during your presentation everything you have done, but you need to address the most important points at least briefly. All the work should be finalized at this point. You should also include some input coming from you (opinion, evaluation, suggestion, discussion, comments) in your presentation. Please, indicate clearly in the slides what your own input is.

- ***Presentation evaluation:***
  - Your grade for the presentation will be determined by a general quality of your presentation, your ability to highlight all the most important points, to provide your input (opinion, evaluation, suggestion, discussion), to keep the exact presentation time, and by your ability to answer the questions asked. The quality of your slides (e.g. too much writing, too small letters) and the oral presentation quality (please, do not read from the slides or from your

notes during the presentation!) will be evaluated as well. You will receive **10%** of the final mark for the presentation itself.

- ***Final project report:***
  - Final project report should be submitted one week after the project presentations, which is on April 16th in the end of the examination period week, *i.e.* May 12th, at 10:00 am. You should submit the hard copy of the report to my mailbox (no electronic copies are accepted). Please, submit it on time, later submissions will be penalized.

  - Final report has to include all the topics described below. Each item below should be addressed at an adequate level of detail.
  - Table of contribution which describes the detailed tasks performed by each team member must be included on the last page of the report.
  - Various tools (MS Excel, AutoCAD, etc.) and templates can be used to create the required documents.
  - The project report has to cover at least the following topics:

Part I. Overview, customer needs and technical requirements

- Provide an overview of the product, the project, and some company background
- Opportunity analysis
  - Describe how you generated potential opportunities
  - Opportunity statement
- Create mission statement
  - Product description, benefit proposition
  - Key business goals (time, cost, quality)
  - Target market(s), target price
  - Assumptions, constraints and stakeholders
- Customer needs analysis resulting in customer needs list
  - Run interviews or surveys
    - Include survey or interview questions description
    - Discuss the survey population, the sample size and the response rate
    - Provide the analysis of the survey responses
  - Organize the needs into hierarchy
  - Prioritize the needs (importance weightings)
- Competitive analysis
  - Identify all the competing products (even potential)
  - Analyze and compare at least 2 products competing with your product
    - In terms of customer needs satisfaction
    - In terms of technical specifications (design metrics)
- Establish target technical specifications
  - Determine ideal values
  - Determine marginal values
- Perform full scale QFD

Part II. Concept generation, evaluation, selection and testing

- Perform concept generation
    - Decompose the problem (product) into sub-problems (using functional decomposition)
    - Search and find multiple (at least 5) solutions for each critical sub-problem
    - Create concept classification tree for each critical sub-problem
    - Create a concept combination table for each set of sub-problems
    - Combine various sub-solutions into several rough product concepts
    - Provide written descriptions and design sketches for at least 5 concepts
- Carry out concept evaluation and selection
    - Concept screening
    - Concept scoring
    - Iterate as necessary
- Perform concept testing
    - Select among the promising concepts or confirm the selection decision
    - Run survey to test the concept(s)
        - Include survey or interview questions description
        - Discuss the survey population, the sample size and the response rate
        - Describe how you communicated the concept
        - Provide the analysis of the survey responses
    - Estimate the sales potential
- Final concept selection – select the most promising concept

Part III. Product design, manufacturing plan and design for X

- Describe the final product generation process
    - Consider functions, form, production and material (refer to Chapter 9 from Ullman's Mechanical design)
- Set the final technical specifications for the product
- Describe manufacturing plan
    - Bill of materials
        - Create a list of components with the assembly hierarchy
        - Include the main characteristics (size, materials, etc.) of all the parts
    - Provide a rough drawing of each part
- Make or buy analysis (some parts must be produced in house and some parts must be purchased)
    - Make or buy decision for each part
    - Suppliers selection for the purchased parts
- Cost estimation (refer to Chapter 11 from Ullman's Mechanical design)
    - Cost estimation of each component
    - Rough cost structure for the product
    - Target costing and design for cost
- Design for X – obligatory are 2 of the following DfX:
    - Design for manufacturing and assembly (preferable)
    - Design for value
    - Design for reliability
    - Design for testing
    - Design for maintenance
    - Design for environment (refer to Chapter 12 from the textbook)

- Evaluation and final reflection over the created product and the design process
    - Anticipated success of the product
    - Lessons learnt
    - Conclusions

- In general, each of the above items should be addressed in a good detail. If you are unable to address any of these points, please, discuss it with me.

- ***Final project report evaluation:***
    - The final project report is worth **20%** of the total final mark. Your grade for the report will be determined by your ability to sufficiently address all the points above. Your ability to communicate ideas in organized and logical fashion, together with the grammatical and organizational quality of your report (including English writing skills) is important too. The timely submission, the suitability of the selected product, the length of the report and the proper referencing are part of the evaluation as well.