The Hebrew University of Jerusalem

Syllabus

Mechanical Product Design and Prototyping - 76954

Last update 10-04-2024

HU Credits: 1

Degree/Cycle: 2nd degree (Master)

Responsible Department: Brain Science: Computation & Information Proc.

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Itamar Frachtenberg

Coordinator Email: itamar.frachtenberg@mail.huji.ac.il

Coordinator Office Hours: 09:00-11:00, 13:00-15:00

Teaching Staff:

Mr. Itamar Frachtenberg

Course/Module description:

One of the Fablab's principles is to guide the users through the process of bringing an idea to a physical shape. The Fablab is supposed to provide the instruments through that process.
The Fablab is currently providing the solutions from the design process to the product, all by its employees. The goal is to provide the tools for the researchers to use their own creativity to achieve their desired products all by themselves, or at least until the manufacturing phase.

Course/Module aims:

This course has two main purposes:
1. Provide the researchers a new fun experience that can actually help them visualize what they want to create when working together with the Fablab employees, for a better collaboration to get the ideal product.
2. Provide the researchers a better understanding of the manufacturing world, so they will know the limitations of the machines and materials, and then aim for the ideal project in terms of budget and waiting time.

Learning outcomes - On successful completion of this module, students should be able to:

In this course the students will learn the basics of a 3D modeling software, in addition to product design principles.
The outcome of the designs will be 3D printed by the students.

Attendance requirements(%):

80%

Teaching arrangement and method of instruction: The course will be served by three methods:
1. Most of the course will teach a software live.
2. Almost each session will include a short presentation.
3. A short "Hands on" with the machines and measuring tools

Course/Module Content:

Day 1- Dive into the manufacturing world:
-From CAD to CAM to the machine- A lecture about the process from the design up

to the finished product.
-Learning Fusion360 basics- from 3D thinking up to designing a 1 simple solid body (Including small breaks for individual practice). Homework for the next session (Something fun, like planning a toy vehicle).
Day 2- Design using CAD:
-Visiting ELSC's Fablab to get to know the machines.
-Learning Fusion360 basics- Continue learning about the features (Including small breaks for individual practice). Homework for the next session to practice 3D printing.
Day 3- Measuring and Manufacturing using CAM:
-Review of measuring tools- Basics and tips including real demonstrations.
-Learning Fusion360 basics- Class practice with measuring tools.
-CAM, Slicer and 2D vector software- A lecture about different kinds of "G-code" generators for different automatic machines.
-PRUSA Slicer- Learning how to use the software for our Fablab's main 3D printers, Including 3D printing a real object.
Day 4- Choosing materials
-Short lecture about materials properties basics.
-Learning Fusion360 basics- Defining materials properties and simulation basics (Including small breaks for individual practice).
Day 5- Laser cutting and Assembly
-Learning the basics of the laser cutting software, including exporting a file for actual cutting.
-Learning Fusion360 basics- Assembly and technical drawing (Including homework).
Day 6- Course project:
-Workshop- Working on the course project, mentoring and answering questions (After this class we will have a couple of weeks break before the final class, to work on the final project. 3D printings and laser cutting will be accepted during those weeks).
Day 7- Quality check:
-Quality check- Presenting the course projects and discussing quality checks for tolerance improvements.
-CAD (Computer aided design)- What else is it used for? A lecture about combining CAD projects with downloadable online 3D files and generating simulations.

Required Reading:

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Additional Reading Material:

https://www.linkedin.com/pulse/how-3d-printing-useful-advance-scientific-research

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 50 %
Attendance / Participation in Field Excursion 50 %

Additional information:

This course is suitable for students in the research field that consistently use physical objects in their research/Course, and sometimes require custom made objects.
In HUJI they can find some different workshops and labs that can manufacture objects from prototypes and up to industrial grade projects.