ME-410

Mechanical product design and development

Paik Jamie

Cursus	Sem.	Type
Mechanical engineering minor	H	Opt.
Mechanical engineering	MA1, MA3	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Project	1 weekly
Number of positions	**30**

It is not allowed to withdraw from this subject after the registration deadline.

Summary

Study and explore design principles of the different mechatronic components and systems. We will cover in-depth especially on meso-scale actuators, sensors and body construction methods.

Content

Each group will be responsible for producing a product based on the hands-on tutorials that will cover
1. acutators (Shape memory alloy, penumatic actuators)
2. structures (origami, cable-pulled underactuated system, 3D printed modular blocks)
3. model (SMA actuator, silicone based blocks)
each group is evaluated on their prototype and report.

Keywords

Sensors and Actuators, Smart actuators, Flexures, Compliant mechanisms. Polymer, Design Methodology, pneumatic actuators, origami robots

Learning Prerequisites

Important concepts to start the course

product development will be on a wearable technology.

Learning Outcomes

By the end of the course, the student must be able to:

- Choose suitable methods and tools for (a) the development of, (b) the modelling and simulation of, (c) the analysis of and (d) the choice of solution for an engineering problem in the mechanical engineering domain (product design, manufacturing process and system production), CP1
- Analyze design requirements to define and quantify the engineering specifications, CP3
- List , define, and quantify the functions of an existing or new design based on the engineering specifications, CP4
- Design a system based on engineering specifications utilizing suitable numerical and analytical tools for optimizing the design parameters, CP10
- Identify the main- and sub-functions of a mechanical system and corresponding main- and sub-systems in a complete

mechanical system / machine to classify the required constitutive elements, CP11
• Illustrate the physical principles of production processes features and limits of production processes, CP12
• Implement and apply project management, budget, technical report, resource management skills, CP13
• Apply , adapt and synthesize learned engineering skills to create novel solutions, CP14
• Develop and iterate multiple design concepts based on the models and simulations, CP15

Teaching methods

lecture, tutorials and group work

Expected student activities

group project

Assessment methods

• No midterm
• The final exam is replaced by remote presentation format

Supervision

Others	Dr. Gunjan Argawal Mr. Matt Robertson Mr. Amir Firouzeh Mr. Zhenishbek Zhakypov

Resources

Notes/Handbook

in class notes

Moodle Link

• https://go.epfl.ch/ME-410