

ME-410

**Mechanical product design and development**

Paik Jamie

<b>Cursus</b>	<b>Sem.</b>	<b>Type</b>
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 Session	Unauthorized Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Lecture	2 weekly
Project	1 weekly
<b>Number of positions</b>	<b>30</b>

**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

Office hours	Yes
Assistants	Yes
Forum	Yes
Others	Dr. Gunjan Argawal Mr. Matt Robertson Mr. Amir Firouzeh Mr. Zhenishbek Zhakypov

### Resources

#### Notes/Handbook

in class notes

#### Websites

- <http://rrl.epfl.ch>

#### Moodle Link

- <https://go.epfl.ch/ME-410>