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. actuators (Shape memory alloy, pneumatic 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