

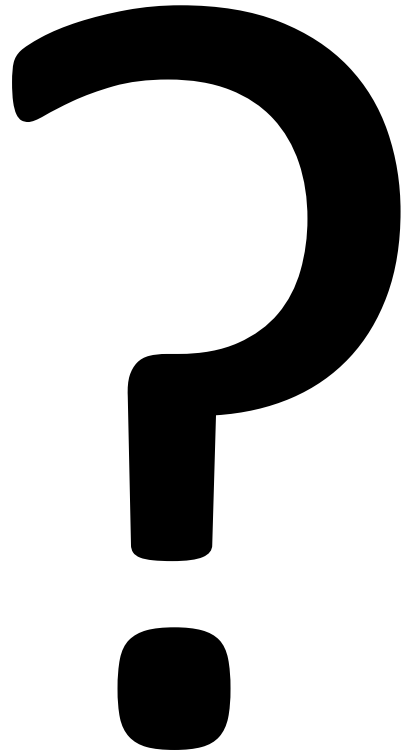
ME-410 Mechanical Product Design and Development

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Motivation

- Study and nurture the creativity and decision-making processes in constructing solutions by being immersed in A to Z of product development. In-depth analysis of the operation principles, advanced meso-scale technologies, and production for their applications in wearables.

Content

- Study and explore design principles of the different **mechatronic** components and systems.
- Study and model meso-scale actuators and integration, construction methods.
- Understand design and working principles of various **smart systems** and 3D architectures in the current state-of-the-art.
- Understand established engineering design process that dictate various product design processes.
- The final report and presentation should reflect the considerations made toward the covered **wearable** methodologies.

Objectives

- To design and to prototype a new product.
- The goal is to learn principles and methods of product development in a realistic context.

- COURSE PREREQUISITES
 - ME 302 (aka ME212) or Microstructures technology I and II\
 - Students are only allowed to take either ME 410 or ME 420.
- Course makeup
 - 3hr / week contact hours, 5 credits

About ME410

- Project based course.
- Form teams of 5–6 students.
- A series of lectures will be given that cover the key aspects of developing a wearable robotic device.
- Each team will have 3-min presentation every week during the class to report the status of the project.
- TA hours: Fridays 13h – 15h (in person and Zoom). Meetings outside these hours are available by appointment only.

Final Deliverables

- **Final poster, flyer, and demo video** (due 21 Nov – soft copy needs to be uploaded to Moodle)
- **Working Prototype Demo for the Public Presentation on 4th Dec at 13h.**
 - A budget of **250 CHF** + a tackle box (Arduino kit + mechanical assembly tool kit) are allocated toward building a prototype for each group
 - High importance on the creative solution, working concept, and a functioning prototype
 - Poster + Screen + Prototype presentation with apero (4th Dec. 17h-20h)
- **Final Presentation in class**
 - Starts at 8h15, 12th Dec.
 - Soft copy of presentation: upload to Moodle on the 12 Dec.
 - 15 min presentation followed by a Q&A session.
 - All members should be present.
 - 5-7 min question period should be answered by anyone from the group
- **Final report (format on Moodle)**
 - Due 19 December
 - Soft copy: uploaded on the OneDrive and on Moodle
 - Late submission will lose 50 % of the grade.

Grading

- 70% Project (20 % Final Report, 20 % Final Presentation, and 30 % Working Prototype Demo)
- 30% Participation (Weekly presentations + participation, mandatory!)
- Everyone in the group will receive the same final grade for the report / presentation / prototype but participation grade may vary.
- Each group is expected to produce update slides prior to the class for presenting to the instructor during the individual group meeting.
- Written report should follow the sample report format

Grading

Demo Day Grading Scales
Cohesive Scenario (10%)
Clear motivation and communication for the need of the product (10%)
Concept novelty (20%)
Maturity of the prototype (20%)
Application of novel technology (20%)
Poster (content and design) (10%)
Videos and other visual aids to communicate better the concept and working principle (10%)

Final Presentation Grading Scale
Organization (20%) Clear goal Clear engineering approach Clear solution selection Timing
Presentation (30%) Audible and confident presentation Cohesive and coherent slides Visually and content-wise illustrative slides Well-practiced talk
Technical Quality (40%) Clear engineering specifications and approach methods Good solution with clear justification Clear presentation of pros and cons of the suggested solutions Analytical and engineering approach to the solution Present and defend the design options during Q&A
Project Participation (10%) Active weekly TP participation Team effort Quality improvement over the semester

- This is a 5-credit course—but it's much more than that.
- It can be very intense, but also highly rewarding.
- Reach out to the TAs frequently for support.
- Choose your teammates carefully: diverse skills and experience make a stronger team.
- Be responsible and accountable to your teammates.
- In-person participation in class sessions and team activities is **mandatory**.
- Check the program and syllabus carefully (in Moodle).
- Lecture recordings available online (links on Moodle).



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Ekrem Yüksel
(Ekrem)



Hugo René Bordereaux
(Hugo)

Ordering materials

- SPOT use (3D-Printing, assemblies, testing, etc.)
 - Cabinet of essential parts available
 - Workbenches
 - Thursdays 3PM – 6PM
 - Fridays 11AM - 5PM
 - Training required
- Ordering happens only on three dates (week 4, 6, and 9)

Brainstorming

- Brainstorm 3 potential “active” **wearable** product idea → straps, fasteners, micro actuations, pumps, are also viable options.
- Prepare a 3 slides for 3 ideas that describes
 - The need
 - Existing concurrent products / patents (Pros and Cons)
 - Functionality – how does it move/ function ? Based on which information?

Potential Projects

- Design and fabrication of **wearable device**:
 - For joint assistance or rehabilitation exercise of wrist, ankle, elbow, finger/thumb glove...
 - Therapeutic shoe insole: change height, angle, center of pressure
 - Self tightening/loosening shoe, sandals, belt, for limited mobility/strength users

Upload by the end of day

- Make a group of 5-6 (put group member names and number on the moodle)
- Brainstorm 3 examples of sustainable technology and make 3 slides
- Upload the slides with your group number