MICRO-606

Scaling in MEMS

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Cursus	Sem.	Type
Advanced Manufacturing		Opt.
Microsystems and Microelectronics		Opt.

Language of teaching	English
Credits	1
Session	
Exam	Oral presentation
Workload	30h
Hours	**14**
Lecture	14
Number of positions	**13**

Frequency

Every 2 years

Remark

4-day course - from August 28 to August 31, 2023. Room Microcity MC B1 273

Summary

This doctoral class covers the scaling of MEMS devices, including mechanical, thermal, electrostatic, electromagnetic, and microfluidic aspects.

Content

- Introduction to scaling laws: scaling of classical mechanical systems, scaling of classical electrical systems, breakdown in scaling, quantum breakdown.
- Thermal effects: conduction, convection, dynamics, breakdown, thermal micro-actuators, microreactors.
- Mechanical devices: mass-spring model, mechanical noise, squeeze film effects.
- Electrical devices: electrostatic micro-actuators, electrostatic breakdown, tunnel sensors, coils and inductors, electromagnetic micro-actuators, magnetostriction, magnetic beads.
- Microfluidics: liquid flow, gas flow, diffusion-mixing, surface tension, entropy trapping.
- Electrokinetics: dielectrophresis, EHD and MHD pumps, electrowetting, electroosmosis, capillary electrophoresis.

Keywords

Scaling laws, thermal micro-actuators, electromagnetic micro-actuators, microfluidics, electrokinetics

Learning Prerequisites

Recommended courses

- and/or microsystems and MEMS technologies
- Basics of physics

Learning Outcomes

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

Transversal skills

- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Use a work methodology appropriate to the task.
- Communicate effectively with professionals from other disciplines.
- Give feedback (critique) in an appropriate fashion.
- Demonstrate the capacity for critical thinking
- Access and evaluate appropriate sources of information.
- Make an oral presentation.

Assessment methods

in-class presentation