

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
<b>Hours</b>	<b>14</b>
Courses	14
<b>Number of positions</b>	<b>13</b>

**Frequency**

Every 2 years

**Remark**

September 13 to 16, 2021

**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: dielectrophoresis, 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