MICRO-606 Scaling in MEMS
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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