Summary
Students will learn simple theoretical models, the theoretical background of finite element modeling as well as its application to modeling charge, mass and heat transport in electronic, fluidic and electromechanical micro and nanosystem.

Content
1. Finite element method - background and implementation
2. Modeling electrostatic problems, voltage and charge distribution
3. Micro and nanoelectromechanical devices: mechanical properties, modeling electromechanical coupling
4. Detection systems for x-ray and gamma ray imaging devices
5. Modeling of fluid mechanics in micro and nanosystems
6. Modeling heat transfer

Learning Prerequisites
Required courses
Basic electronics and physics

Learning Outcomes
By the end of the course, the student must be able to:
- Choose the appropriate approach to modelling a simple device
- Design a Comsol model appropriate for a given device type
- Interpret the predictions from a model
- Solve a simple theoretical device model
- Perform a sanity check on a model
- Choose the appropriate boundary conditions

Teaching methods
Ex cathedra
Exercises on a computer using Comsol
Project work in a small group

Assessment methods
Project report and presentation