EE-536

Physical models for micro and nanosystems

Kis Andras

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.
MNIS	MA3	Obl.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	Written
Workload	60h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

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

Written exam - 50%
Project - 50%