*Course syllabus*

# Introduktion till mikrofluidik och lab-on-a-chip system
# Introduction to Microfluidics and Lab-on-a-chip Systems

## EEMN21, 7,5 credits, A (Second Cycle)

**Valid for:** 2023/24
**Faculty:** Faculty of Engineering, LTH
**Decided by:** PLED BME
**Date of Decision:** 2023-04-13

## General Information

**Elective for:** BME4-bf, E4-mt, F4, F4-mt, F4-nf, MNAV2, N4, N4-nbm, MLAK2
**Language of instruction:** The course will be given in English on demand

## Aim

The course gives a broad introduction to the area of microfluidics with an outlook towards lab-on-a-chip systems. Microfluidics and lab-on-a-chip systems deal with liquid and gas flows in micrometer-sized channels, often for chemical and biochemical analysis. The area is interdiciplinary, where micro- and nanotechnologies are utilised for integration of electrical, mechanical, chemical and optical functions on a chip. Systems based on microfluidics play an important role in the areas of chemistry, biology and medicine.

## Learning outcomes

*Knowledge and understanding*
For a passing grade the student must

- Understand how design geometries and physical parameters affect the properties and function of microfluidic systems.
- Be able to describe available methods for fabrication of microfluidic systems and control of microsscale flows.
- Be able to describe common components and functions of a microfluidic system.

*Competences and skills*
For a passing grade the student must

- Be able to experimentally build and use microfluidic systems together with instrumentation to study those.
- Be able to design a simple microfluidic system.
- Be able to read, summarise and discuss scientific articles in the field of microfluidics and lab-on-a-chip systems.
- Be able summarise and discuss experimental results orally and in writing.

*Judgement and approach*
For a passing grade the student must

- Be able to analyse advantages and limitations when miniaturising fluidic systems.
- Be able to evaluate scientific results within the field of the course and their benefit to society.

## Contents

Fluid mechanics in microsystems, materials and methods for fabrication of microfluidic systems, surface tension, viscosity, diffusion, dimensionless parameters (e.g. the Reynolds number), flow characterisation, valves, mechanical and electrokinetical pumps, mixing, droplet microfluidics, chemical separation, cell separation, detection, applications within chemistry, biology and medicine, and acoustics on chip.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)
**Assessment:** Compulsory parts to be passed: lab exercises including reports, project work including presentation and report, and written exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

**Parts**
**Code:** 0120. **Name:** Examination.
**Credits:** 4. **Grading scale:** TH. **Assessment:** Graded exam.
**Code:** 0220. **Name:** Lab 1-3, Article Presentation, Project Report & Presentation.
**Credits:** 3,5. **Grading scale:** UG. **Assessment:** Approved laboratory exercises Approved article presentation Approved project report and presentation

## Admission

**Assumed prior knowledge:** Fundamental courses in physics, chemistry or biology.
**The number of participants is limited to:** 32
**Selection:** Number of credits within the programme. Priority is given to students enrolled on programmes that include the course in their curriculum.
**The course overlaps following course/s:** EEMN20, EEM055

## Reading list

- Albert Folch: Introductin to BioMEMS. ISBN: 978-1-4398-1839-8. (Complementary literature).
- Lecture slides, exercises and lab instructions.

## Contact and other information

**Course coordinator:** Pelle Ohlsson, pelle.ohlsson@bme.lth.se
**Course coordinator:** Per Augustsson, per.augustsson@bme.lth.se
**Course homepage:** https://bme.lth.se/course-pages/introduction-to-lab-on-a-chip-systems/introduction-to-lab-on-a-chip-systems/