

Course title
Bio-MEMS

Code
BIO9010

ECTS credits 10
Faculty Faculty of Technology and Maritime S
Location Høgskolen i Vestfold
Teaching Language English

Participants

Ph.D. students at HiVe and collaborating institutions

Prerequisite knowledge

Introductory electromagnetics and semiconductor device physics. Parallel introduction to MEMS

Aim and Objectives

Upon completion of this course the student should be able to:

- Basic knowledge in the main areas of the cell and molecular biology of the living macro and micro world
- Molecular and biological techniques; cell culture, 3D cell cultivation, in situ hybridization, target and signal amplification and detection, ELISA, Electrophoresis, NASBA, cell concentration, chromatography, spectroscopy, blotting techniques, proteomics, absorbance and fluorescence measurements
- demonstrate a good overview of measurement techniques based on microfluidics, mixing systems, polymer behavior, biological composition, pumping, surface chemistry, molecular, and structural principles
- explain and master the most common characterization techniques for microsystem devices made in silica, glass or plastics used in biological applications
- select the most appropriate techniques for specific measurement problem
- list and compare key techniques and components and their applications and limits
- learn how to establish an assembly lines
- perform microfluidics, microfluidic calculation and simulations, biological and device characterization.

Outline Syllabus

Characterization techniques such as:

- Microsystem devices in silica or glass
- Microsystem techniques used on plastics
- Simulation and design of devices for biological and biochemical analysis
- Microfluidics and pumping
- BioMedical Engineering techniques and sensors
- Conventional and on chip target and signal amplification and detection
- Cell cultivation on Chip – The use of microscope
- Microbiology and Immunoassay technologies
- Conventional sample preparation
- Sample preparation, concentration, lysis, manipulation on Chip
- Conventional and on Chip DNA/RNA purification

Work Methods/Teaching

Lectures, laboratory work and independent project work

Assessment /Method(s)

Written examination, 5 hours, 100 %.

Reading list

- Seven chapters from: Fundamentals of BioMEMS and Medical Microdevices (SPIE Press Monograph Vol. PM153) Steven S. Saliterman. Three chapters from: Bio-MEMS Technologies and Applications
- Three chapters in the CELL. Alberts et al., 2008, Three chapters in Molecular Cloning A Laboratory Manual. Three chapters in Protein Array Technology; Dev Kambhampati Wiley 2004, Two chapters Manual of Clinical Microbiology ASM Press.
- Different lecture notes related to microfluidics, biomedical engineering, cell biology, microbiology, Micromachining methods and BioMEMS technology. Dr Eric Johannessen, Professor Frank Karlsen, Dr Lars Roseng, Dr Tao Dong, MS Ellen Tenstad.
- Different scientific articles: Gulliksen et al., 2007, Bayraktar et al., 2006, Zhang et al., 2006, Obeid et al., 2004, Petersen et al., 2004, Beebe et al., 2002, Becket er al., 2002, Dittrich et al., 2006, DiBernardo et al., 2007, Holland and Kiechle., 2005, Toner and Irimia., 2005, Fiorini et al., 2005, Becher and Lacascio., 2001, Gheroghe and Galvin BioMEMS Fabrication, Tang and Persing Chapter 13, Zhang et al., 2006.

Coordinator (Professional responsible)

Asc. Professor Lars Roseng and Professor Frank Karlsen