3. Semester

Module title: Sensor Miniaturization

Module summary
Module code: SSTM310
Module coordinator: Prof. Dr.-Ing. Christian Karnutsch
Credits (ECTS): 6 CP
Semester: 3
Pre-requisites with regard to content: Basic knowledge of solid state physics and chemistry
Pre-requisites according to the examination regulations: none
learning outcomes and competencies: • Upon successful completion, the students… • understand fabrication technologies for optofluidic sensor systems • can independently assess which effects can be used to realize micro-, nano- and optofluidic systems • are able to assess the potential for miniaturization of advanced and complex analysis systems • are able to select the correct measuring instrument to be used based on the structural size and geometry of a component • can design the microtechnological process route required for the fabrication of miniaturized sensor systems • understand the fundamental engineering principles of micro- and nanosystems
Assessment: Assessment is done by a written exam (120 minutes)

Course: Optofluidic Sensor Systems
Module code: SSTM311
Lecturer: Prof. Dr.-Ing. Christian Karnutsch
Contact hours: 2 SWS
Semester of delivery: yearly, summer
Type/mode: lecture
Language of instruction: English
Content: • Thin-film deposition and structuring techniques that are widely used in the fabrication of polymer-based, semiconductor-based and glass-based micro-scale sensor systems • Instruments for micro- and nanomeasurements to study, measure, analyze and image structures at the micro- and nanoscale • Selected analysis systems and their miniaturization
Recommended reading: [1 Fabrication Engineering at the Micro- and NanoscaleStephen A. Campbell; Oxford University Press

[2] MEMS and Microsystems: Design, Manufacture, and Nanoscale Engineering Tai-Ran Hsu; John Wiley & Sons [3] Optofluidics: Fundamentals, Devices, and Applications Yeshaiahu Fainman, Luke Lee, Demetri Psaltis, Changhuei Yang; McGraw Hill Professional [4] Scanning Electron Microscopy and X-Ray MicroanalysisJoseph Goldstein, Dale Newbury, David Joy, Charles Lyman, Patrick Echlin, Eric Lifshin, Linda Sawyer, and Joseph Michael; Springer
Comments: -

Course: Micro- and Nanotechnology
Module code: SSTM312
Lecturer: Prof. Dr. Markus Graf
Contact hours: 2 SWS
Semester of delivery: yearly, summer
Type/mode: lecture
Language of instruction: English
Content: • Introduction to microsystem and nanotechnology • Scaling effects in microsystem technology • Fundamental microsystem process sequence • Photolithography • Silicon as enabling material for microtechnology • Thin film deposition methods • Etching methods • Process examples (e.g. pressure sensors and accelerometers) • Hybrid System Integration: Bridging the micro- and nanoscale to the macroscopic world • Principles and applications of microfluidics • Small is beautiful: Further miniaturization and novel functionalities by Nanotechnology
Recommended reading: Lecture slides will be provided in the online learning system. G. Gerlach & W. Dötzel: Introduction to Microsystem Technology - A Guide for Student, Wiley, 2008S. Globisch: Lehrbuch Mikrotechnologie, Carl Hanser Verlag, 2011 (only available in German) M. Madou: Fundamentals of Microfabrication & Nanotechnology, Volume I & II, CRC Press, 2011 J. Ramsden: Nanotechnology, Elsevier, 2011
Comments: