2.1 Sensors A

Sensors A

Module summary
Module code: STM210
Module coordinator: Prof. Dr. Harald Sehr
Credits (ECTS): 6
Semester: 2
Pre-requisites with regard to content: STM110 Advanced Physics, STM140 Advanced Chemistry
Pre-requisites according to the examination regulations: --
Competencies: Students understand the different working principles of sensors and are able to choose a suitable sensor for a given application. They can design electronic circuits for signal conditioning and evaluate transfer functions and sensor characteristics of resistive and capacitive sensors. They comprehend the fundamentals of chemosensors, their technological implementation, applications and respective challenges of practical measurements. Students understand the physics and technology of modern light sources and optical detectors, and can design advanced optical sensing systems.
Assessment: Written Examination of 180 min duration

Course: Physical Sensors A
Module code: STM211
Lecturer: Prof. Dr. Harald Sehr
Contact hours: 2 SWS
Semester of delivery: Winter Semester
Type/mode: Type: Lecture / Mode: Mandatory
Language of instruction: English
Content: The fundamentals of sensor technology are given, working principles of physical sensors are explained and methods of signal conditioning are discussed. The topics in detail are: Sensor characteristics and transfer function, resistive temperature sensors, strain gauges, resistive force sensors, resistive pressure sensors, signal conditioning, capacitive sensors, inertial sensors.
Recommended reading: Fraden, Handbook of Modern Sensors, AIP Press, Springer; Doebelin, Measurement Systems, McGraw-Hill
Comments: Lecture notes are available on ILIAS.

Course: Optical Sensors
Module code: STM212
Lecturer: Prof. Dr.-Ing. Christian Karnutsch
Contact hours: 2 SWS
Semester of delivery: Winter Semester
Type/mode: Type: Lecture / Mode: Mandatory
Language of instruction: English
Content:

- Light sources for optical sensing
- the detection of optical radiation
- advanced optical sensing systems
- fiberoptic sensors
- interferometric sensors
- modern application examples are discussed.

Recommended reading:
Light-emitting Diodes, EF Schubert, Cambridge University Press
Understanding Fiber Optics, J Hecht, Prentice Hall International
Fiber Optic Sensors: An Introduction for Eng. and Scientists, E Udd, Wiley
Advanced Photonic Structure for Biological and Chemical Detection, X Fan, Springer
Optics, Eugene Hecht, Addison-Wesley

Comments: Lecture notes and all other course materials are available on ILIAS.

Course: Chemical Sensors A
Module code: STM213
Lecturer: Prof. Dr. Markus Graf
Contact hours: 2 SWS
Semester of delivery: Winter Semester
Type/mode: Type: Lecture / Mode: Mandatory
Language of instruction: English
Content: An overview on the immense potential of chemical sensing for a wide range of applications such as environmental monitoring, process automation, human health, comfort and energy efficiency is given. Furthermore, a practical framework for assessing the requirements and performance of chemosensors is introduced. Fundamental chemical concepts are applied to understand typical sensor characteristics. Sensors are described according to their transduction principles with focus on mechanical, thermal and optical chemosensors including the recent trends of miniaturization.
Recommended reading: J. Janata, Principles of Chemical Sensors, Springer P. Gründler, Chemical Sensors, Springer Fundamentals: Brown et. al., Chemistry – The Central Science, Pearson, (SI units) P. Atkins, J. de Paula & J. Keeler, Physical Chemistry, Oxford University Press
Comments: Corresponding lecture notes and complementary materials are available on ILIAS.