2.5 Focal Subjects A and B (2)

Focal Subject 2

Module summary
Module code: STM240 and STM340
Module coordinator: Prof. Dr. Karsten Pinkwart
Credits (ECTS): 4
Semester: 2 and 3
Pre-requisites with regard to content:
Pre-requisites according to the examination regulations: --
Competencies: After successful completion of this module, the student is able: to carry out a technical and economic analysis of the electrical storage requirements to evaluate technologies for storage in the form of electrical energy, electrochemical energy, material energy, mechanical energy to carry out a comparison of the storage systems to analyse technical and economic parameters to show perspectives to collect the right energy storage and / or conversion system for his application to implement the energy storage and / or conversion system in a exisiting application architecture to differentiate between power and energy optimized systems and applications
Assessment: Written exam of 60 mins in each semester

Course: Electrochemical Storage Systems
Module code: STM247
Lecturer: Prof. Dr. Karsten Pinkwart
Contact hours: 2
Semester of delivery: Winter Semester
Type/mode: lecture and lab
Language of instruction: English
Content: The students will get a comprehensive overview of electrochemical energy and conversion methods, including batteries, redox-flow batteries, fuel cells, supercapacitors, hydrogen generation and storage. The lecture addresses electrochemical processes, materials, components, degradation mechanisms, device assembly and manufacturing, while also discussing the challenges and perspectives for each energy storage device. The students will learn fundamentals of energy storage and conversion. The lecture is concentrated on technology aspects for mobile application.
Recommended reading: Crompton, T.R.; Battery Reference Book; Reed Educational and Professional Publishing Ltd; Oxford 2000 Linden, D.; Reddy, T.b.; Handbook of Batteries; McGraw Hill; New York 2001 Garche, J.; Dyer, C.K.; Moseley, P.T.; Encyclopedia of Electrochemical Power Sources; Elsevier Science; Amsterdam 2009

Course: Renewable Electricity Generation and Storage
Module code: STM347

Lecturer: Prof. Dr. Karsten Pinkwart
Contact hours: 2
Semester of delivery: Summer Semester
Type/mode: lecture
Language of instruction: English
Content: The lectures subject is the technical evaluation of different forms of energy storage. The aim is, to point out the potential as well as the physically and material technical limits of these techniques. Special attention applies to energy densities and energy efficiency. Students will understand the abilities of these techniques due to different applications.
Recommended reading: Patrick T. Moseley Jurgen Garche, Electrochemical Energy Storage for Renewable Sources and Grid Balancing, Elsevier, Amsterdam 2014 Bent Sørensen, Renewable Energy- Physics, Engineering, Environmental Impacts, Economics and Planning, Academic Press, 2017 Pengwei Du Ning Lu, Energy Storage for Smart Grids-Planning and Operation for Renewable and Variable Energy Resources (VERs), Academic Press, 2014 Yasar Demirel, Energy - Production, Conversion, Storage, Conservation, and Coupling, Springer, 2012 Robert A. Huggins, Energy Storage - Fundamentals, Materials and Applications, Springer, 2016
Comments:

2.6 Focal Subjects A and B (3)

Module title: Focal Subject 3

Module summary
Module code: -STM240 and STM340
Module coordinator: Prof. Dr. Jan Hoinkis
Credits (ECTS): 4
Semester: 2 and 3
Pre-requisites with regard to content: chemistry, physics, physical chemistry
Pre-requisites according to the examination regulations: --
Competencies: Participants will be able: • to evaluate and select suitable sensors in wastewater and exhaust gas treatment • to evaluate and design water treatment processes with a focus on membrane technology and sensors • operate analytical measuring instruments under instruction and understand the underlying measuring principles • to solve a complex task in the field of water and exhaust gas treatment together as a team • to plan, carry out and evaluate accompanying analytics for water and exhaust gas treatment processes
Assessment: Written examination of 1 hour each elective

Course: Environmental Process Technology
Module code: STM244
Lecturer: Prof. Dr. Jan Hoinkis
Contact hours: 2
Semester of delivery: Winter Semester
Type/mode: Type: lecture, mode: optional
Language of instruction: English
Content: Ecotoxicology, wastewater contaminants, sewage treatment plants, industrial wastewater treatment, exhaust gas purification for automotives and power plants, solid waste management, production integrated technologies
Recommended reading: P. Atkins, L. Jones, W.H. Freeman, Chemical Principles, Macmillan Learning, D.C. Harris, Quantitative Chemical Analysis, W.H. Freeman, D.W. Connell, Concepts of Environmental Chemistry, CRC Press, M.R. Templeton, D. Butler, Introduction to Wastewater Treatment, bookboon.com, T.K. Sen, Physical, Chemical and Biological Treatment Processes for Water and Wastewater, Nova Science Publishers, R.W. Baker, Membrane Technology and Applications, Wiley
Comments

Course: Environmental Sensorics
Module code: STM344
Lecturer: Prof. Dr. Michael Bantel / Prof. Dr. Ulrich Schönauer
Contact hours: 2
Semester of delivery: Summer Semester
Type/mode: Type: e.g. lecture, lab, seminar; mode: mandatory or optional
Language of instruction: English

Content: • Basics of radioactivity, • measuring radioactivity in environment, • effect on humans, • sensors/detectors for measuring radioactivity
Recommended reading: Script for lecture, Glenn Knoll: “Radiation Detection and Measurement” 4th edition
Comments:

2.7 Focal Subject A and B (4)

Module title: Focal Subject 4

Module summary
Module code: -STM240 and STM340-
Module coordinator: Prof. Dr. Harald Sehr
Credits (ECTS): 4
Semester: 2 and 3
Pre-requisites with regard to content:
Pre-requisites according to the examination regulations: --
Competencies: Students understand the fabrication technologies for silicon microsystems and hybrid integrated electronic circuits. They are able to choose a suitable fabrication sequence for a certain system and can evaluate the advantages and risks of different fabrication approaches.
Assessment: Written examination of 60 min duration each semester

Course: Hybrid Technology
Module code: STM248
Lecturer: Prof. Dr. Ulrich Schönauer
Contact hours: 2
Semester of delivery: Winter semester
Type/mode: *lecture*
Language of instruction: English
Content: • Thick-film and hybrid technology in sensor production • Introduction to thick-film technology • Basic materials, components, manufacturing • Layer systems, Production, quality control • Circuit lay-out, Design rules, Print cycles, • Screen manufacturing, Screen printing, Parameters, • Quality control, Drying and sintering • Comparison: thick- vs. thin-film technology • Structure dimensions, Assembly and packaging • Surface mount technology (SMT) • Active and passive devices (SMD), • Connection technologies, Soldering processes • Adhesive employment, Chip-on-board processes • Die- and wire-bonding, Welding processes, Packaging
Recommended reading: *Gupta, T. K.: Handbook of Thick-Film and Thin-Film Hybrid Microelectronics* *Wiley-Interscience* *Sergent, J. E.: Hybrid Microelectronics Handbook, McGraw Hill*
Comments: Lecture notes are available on ILIAS.

Course: Microsystems
Module code: STM346
Lecturer: Prof. Dr. Markus Graf
Contact hours: 2
Semester of delivery: Summer Semester
Type/mode: lecture
Language of instruction: English
Content: • Introduction • Photolithography • Deposition Technologies • Evaporation, Sputtering, Chemical Vapour Deposition • Properties of Differently Deposited Films • Etching Technologies • Wet Etching • Dry Etching • Deep Reactive Ion Etching • Examples of Fabrication Sequences
Recommended reading: *Madou, Fundamentals of Microfabrication, CRC Press,(2002)* Kovacs, Micromachined Transducers Sourcebook, WCB McGraw-Hill, 1998
Comments: Lecture notes are available on ILIAS.