1.1 Advanced Physics

Module title: Advanced Physics

Module summary
Module code: STM110
Module coordinator: Prof. Dr. Roland Görlich
Credits (ECTS): 6
Semester: 1
Pre-requisites with regard to content: Basic knowledge in mathematics and physics (Bachelor level)
Pre-requisites according to the examination regulations: --
Competencies: After successful completion of the module • Students understand the causes and effects of electromagnetic interactions. They know the phenomena of classical electrodynamics and understand their general mathematical descriptions (Maxwell laws) as well as their applications • Students have an understanding of the quantized form of electromagnetic waves (photons) and their interaction with matter • Students have knowledge of the description of quantum mechanical systems • Students will be able to understand and analyze sensor principles based on theoretical models, giving them a deeper understanding of the underlying physical mechanisms • Students are able to network different phenomena with the help of theoretical models and thus structure the field of knowledge • Students are also qualified for more ambitious tasks in the development of sensors • In the course of exercises, students are enabled to present and transport topics from the lecture, to realize and discuss problems and to solve them methodically. In addition, they also acquire social skills in the environment of learning situations.
Assessment: Written examination 120 minutes with mark

Course: Physics
Module code: STM112
Lecturer: Dr. Peter Weidler
Contact hours: 2 lecture hours per week
Semester of delivery: yearly in summer semester
Type/mode: lecture including tutorial
Language of instruction: English
– Content: – Vector Analysis / scalar and vector potentials – Electrostatics / Electromagnetic Fields – Maxwell Equations / Solution of Maxwell Equations
– Recommended reading: – Feynman, Leighton, Sands: Lectures on Physics Electromagnetism and Matter, Vol. II, Part I, Addison Wesley, R. Oldenbourg Verlag – Serway, Jewett: Physics for Scientists and Engineers, Brooks/Cole Thomson – Griffiths: Introduction to Electrodynamics (4th ed.) Pearson Cambridge University Press, 2017 – Shadowitz, Albert: The electromagnetic field, Dover Publications, 1975
Comments: The lecture requires good knowledge in mathematics: calculus and basics in analytical geometry

Course: Solid State Physics
Module code: STM113
Lecturer: Prof. Dr. Roland Görlich
Contact hours: 2 lecture hours per week
Semester of delivery: yearly in summer semester
Type/mode: lecture and exercise / optional
Language of instruction: English
Content: – Aspects of "Modern Physics" (Quantum Theory) – Photons and optical sensors, LASER – Principles of solid-state theory, especially in the field of semiconductors – Diffusion theory based on master equations
Recommended reading: – Lecture notes and exercise sheets – Feynman, Richard Phillips: The Feynman Lectures on Physics, 3 Vols.*, Addison-Wesley – Sternheim, Morton M.: General physics, New York, John Wiley, 1991 – Kittel, Charles: Introduction to Solid State Physics, John Wiley & Sons, Inc., 2005 – Kittel, Charles; Kroemer, Herbert: Thermal Physics, W.H. Freeman and Company New York, – Ashcroft, Neil W.; Mermin, N. David: Solid State Physics, Harcourt Brace College Publisher – Coleman, Charles C.: Modern Physics for Semiconductor Science, WILEY-VCH – Sze, S.M.: Semiconductor devices, Wiley, 2002 – Bird, R. Byron; Stewart, Warren E.; Lightfood, Edwin N.: Transport Phenomena, John Wiley & Sons, Inc.
Comments: