Module	***Semiconductor Physics: Devices and Low-Dimensional Systems***
Code	71598
Instruction language	German or English
ECTS credits	6
Credit hours	6
Duration	1 semester
Cycle	Each summer semester
Coordinator	Prof. Klaus Thonke
Lecturer	Prof. Klaus Thonke
Allocation to study programmes	Physics M.Sc., elective module, 1st or 2nd semester Wirtschaftsphysik M.Sc., elective module, 1st - 3rd semester Electrical Engineering M.Sc., elective module, 1st - 3rd semester
Formal prerequisites	None
Recommended prerequisites	Modules *Solid State Physics* and *Semiconductor Physics: Fundamentals*
Learning objectives	Students who successfully passed this module • have a deeper understanding of the fundamentals and applications of semiconductor physics • know the basic operation principles of bipolar and homopolar devices • are familiar with basic effects of low-dimensional structures and with the current or future components working with them (single electron transistor, strained hetero systems, quantum cascade laser, …) • master modern and sophisticated experimental methods of investigation in the field of solid state physics and in particular semiconductor physics • are able to present their experimental results and the underlying physical relationships in a scientific way
Syllabus	• Bipolar diodes, transistor • Field-effect transistors • Quantization effects in low dimensions • Semiconductor light-emitting diodes and lasers • Procedures to manufacture nanostructures • Spectroscopy of nanostructures (electrical, optical) • Quantum effects in low-dimensional semiconductor structures Laboratory course • Temperature-dependent photoluminescence of quantum wells • Determination of optical transition energies using photo-reflection • Optical spectroscopy of semiconductors with the Fourier spectrometer
Literature	• Lab Manual • Sauer R., Halbleiterphysik (Oldenbourg, München, 2009) • Marius Grundmann, The Physics of Semiconductors (Springer 2006)

Teaching and learning methods	Lecture (3 hours per week) Exercise (1 hour per week) Laboratory course (2 hours per week)
Workload	45 hours lecture (attendance time) 15 hours exercise (attendance time) 30 hours laboratory course (attendance time) 90 hours self-study and exam preparation Total: 180 hours
Assessment	Written or oral examination. A prerequisite for the participation in the examination is an ungraded course achievement. Form and scope of the examination and of the course achievement are determined and notified by the lecturer at the beginning of the course.
Examination	12078 Semiconductor Physics II (precourse) 12077 Semiconductor Physics II
Grading procedure	The module grade is the examination grade.
Basis for	Research in the field of Semiconductor Physics