

Department	06 Applied Sciences and Mechatronics
Course title	Micro- and Nanotechnological Devices
Course number	MNM013
Hours per week (SWS)	4
Number of ECTS credits	6
Course objective	The module provides knowledge of the mathematical and quantum-theoretical basics that are necessary for a deeper understanding of the special physical properties of low-dimensional and nanoscale structures.
Prerequisites	basic solid state physics.
Recommended reading	R. Waser, Nanoelectronics and Information Technology: Materials, Processes, Devices, Wiley-VCH
Teaching methods	lecture, exercise sessions
Assessment methods	written examination 90'
Language of instruction	English
Name of lecturer	Prof. Dr. Matthias Gramich, Prof. Dr. Helmut Fischer
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Link	https://sci-intern.hm.edu/fk/modulbeschreibungen.php?lang_nr=&id=2144
Course content	<ul style="list-style-type: none">• WKB approximation in nanoelectronics and the application of tunnelling in devices• 2DEG (two dimensional electron gas) and its application• Resonant tunnel diodes and its application• Diffusive and ballistic charge transport in quantum wires and quantum dots• Quantized conductivity• Coulomb blockade and single electron transistors• Quantum Hall Effect and its application• Phonon dispersion relation• Graphene as a new star on the horizon of material science and its application• Superconductivity and its application• Application of Josephson Junctions• Spintronics
Remarks	