Courses in English
Course Description

Department	06 Applied Sciences and Mechatronics
Course title	**Quantum Sensing**
Hours per week (SWS)	4
Number of ECTS credits	6 CP
Course objective	The course focuses on a comprehensive overview in the field of Quantum Sensing with special emphasis on solid state implementations of q-bits and gain an improved understanding of approaches to prepare quantum states in artificial atoms. The course presents selected examples of sensors working at the limit of the quantum mechanical ground state like sensors for motion, radiation or magnetic fields. Participants improve their physical understanding of quantum non demolition detection schemes in solid state systems. Another focus lies on the physical origin of decoherence processes and practical measures to minimize them. The skills to read, understand and critically evaluate articles focussing on quantum sensing is trained with special focus on high impact journals like nature or science and review articles.
Prerequisites	Quantum Physics 1
Recommended reading	Selected scientific articles provided during the course, R. Waser, Nanoelectronics and Information Technology: Materials, Processes, Devices, Wiley-VCH.
Teaching methods	lecture, exercise session, seminar
Assessment methods	written exam, seminar
Language of instruction	English
Name of lecturer	Prof. Matthias Gramich
Email	matthias.gramich@hm.edu
Link	http://www.fb06.fh-muenchen.de/fk/modulbeschreibungen.php?id=1915
Course content	Applied superconductivity Practical realization of the quantum metrological triangle (I (Millikan => SET),V (Josephson),U (Quantum Hall)) Quantum realization of the Kelvin (Quantum sensing of noise, Single Electron Transistor), the Kilogram => Planck constant and the Second => atomic clock and applications (GPS) Quantum sensors for single magnetic moments Quantum ground state of mechanical vibration Qbit realisations with emphasis on solid state implementations Basic quantum computation realisation: phase Qbit, Flux Qbit, Transmon, Finnmon, Rabi osszilation, quantum readout scheme. Sensors based on Spintronics NV centre in diamond => sensing application (Data storage, biology, spintronics)
Remarks	