Department	06 Applied Sciences and Mechatronics
Course title	**Quantum Sensing**
Hours per week (SWS)	4
Number of ECTS credits	6
Course objective	The participants gain a comprehensive overview in the field of Quantum Sensing with special focus on solid state implementations. The students have an improved understanding of approaches to prepare quantum states in artificial atoms. They know selected examples of sensors working at the limit of the quantum mechanical ground state like sensors for motion, radiation or magnetic fields. They have improved their physical understanding of quantum non demolition detection schemes in solid state systems. They understand the physical origin of decoherence processes and practical measures to minimize them. They have improved their technical English and skills to read, understand and critically evaluate articles focussing on quantum sensing with special focus on high impact journals like nature or science and review articles.
Prerequisites	Quantum Physics I
Recommended reading	Selected scientific papers,
Teaching methods	Lecture, Seminar, Exercise session
Assessment methods	written exam
Language of instruction	English
Name of lecturer	Prof. Matthias Gramich
Email	matthias.gramich@hm.edu
Link	https://sci-intern.hm.edu/fk/modulbeschreibungen.php?id=1915
Course content	Applied superconductivity Practical realization of the quantum mechanical 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	