The course will focus on the operational principles and underlying physical effects of microstructured electronic and mechatronic devices and microsystems and their application fields. In particular, the course will address the following topics: Basic physical effects in solid-state microstructured electronic and micromechatronics devices and their application fields (microelectronics, microsensors, microactuators, and microsystems). Characteristic material properties of semiconductors: Intrinsic and extrinsic electrical conductivity, mobility, charge carrier transport by drift and diffusion, carrier generation-recombination, thermal conductivity, energy domain coupling effects (thermoelectricity, piezoresistance, piezoelectricity, thermoelasticity, galvanomagnetism etc.). Basic operational principles of microdevices: pn junction, MOS field effect, unipolar and bipolar electronic devices, power devices, various transducer effects. Phenomenological transport theory: Onsager’s transport model, continuous field models of energy-coupled multi-domain systems, physics-based macro-modeling of microsystems. Selected sensor and actuator application examples.