Electrical Engineering: Solid State Devices & Micro Sys Fabric

**EEMF 5383 (PHYS 5383)** Plasma Technology (3 semester credit hours) Hardware oriented study of useful laboratory plasmas. Topics will include vacuum technology, gas kinetic theory, basic plasma theory and an introduction to the uses of plasmas in various industries. (3-0) T

**EEMF 6315** Advanced Electronic Packaging Technologies (3 semester credit hours) Electrical design and analysis—signal and power integrity, thermal designs at chip-package-board level, cooling solutions, thermo-mechanical designs and interface stress analysis. Reliability testing and failure modes. Electronic packaging materials, properties and characterization, chip-package interconnection technologies, wafer scale and 3D packaging, encapsulation techniques, multi-chip modules and system in package-heterogeneous integration technologies. Design for performance, reliability, and manufacturing. (3-0) Y

**EEMF 6319** Quantum Physical Electronics (3 semester credit hours) Quantum-mechanical foundation for study of nanometer-scale electronic devices. Principles of quantum physics, stationary-state eigenfunctions and eigenvalues for one-dimensional potentials, interaction with the electromagnetic field, electronic conduction in solids, applications of quantum structures. Prerequisite: **ENGR 3300** or equivalent. (3-0) Y

**EEMF 6320 (MSEN 6320)** Fundamentals of Semiconductor Devices (3 semester credit hours) Semiconductor material properties, band structure, equilibrium carrier distributions, non-equilibrium current-transport processes, and recombination-generation processes. Corequisite: **EEMF 6319** or equivalent. (3-0) Y

**EEMF 6321 (MSEN 6321)** Active Semiconductor Devices (3 semester credit hours) The physics of operation of active devices will be examined, including p-n junctions, bipolar junction transistors and field-effect transistors: MOSFETs, JFETS, and MESFETS. Active two-terminal devices and optoelectronic devices will be presented. Recommended corequisite: **EEMF 6320** or **MSEN 6320**. (3-0) Y

**EEMF 6322 (MECH 6348 and MSEN 6322)** Semiconductor Processing Technology (3 semester credit hours) Modern techniques for the manufacture of semiconductor devices and circuits. Techniques for both silicon and compound semiconductor processing are studied as well as an introduction to the design of experiments. Topics include: wafer growth, oxidation, diffusion, ion implantation, lithography, etch and deposition. (3-0) T

**EEMF 6324 (MSEN 6324)** Electronic, Optical and Magnetic Materials (3 semester credit hours) Foundations of materials properties for electronic, optical and magnetic applications. Electrical and thermal conduction, elementary quantum physics, modern theory of solids, semiconductors and devices, dielectrics, magnetic and optical materials properties. Prerequisite: **MSEN 5300** or equivalent. (3-0) T

**EEMF 6327 (MSEN 6327)** Semiconductor Device Characterization (3 semester credit hours) This course will describe the theoretical and practical considerations associated with the most common electrical and reliability characterization techniques used in the semiconductor industry. Prerequisite: **EEMF 6320** or **MSEN 6320** or equivalent) or instructor consent required. (3-0) T

**EEMF 6348 (MECH 6341 and MSEN 6348)** Lithography and Nanofabrication (3 semester credit hours) Study of the principles, practical considerations, and instrumentation of major lithography technologies for
EEMF 6372 Semiconductor Process Integration (3 semester credit hours) The integration of semiconductor processing technology to yield integrated circuits. The course will emphasize MOSFET design based upon process integration, in particular as it applies to short channel devices of current interest. Process simulation will be used to study diffusion, oxidation, and ion implantation. (3-0) R

EEMF 6382 (MECH 6347 and MSEN 6382) Introduction to MEMS (3 semester credit hours) Study of micro-electro-mechanical devices and systems and their applications. Microfabrication techniques and other emerging fabrication processes for MEMS are studied along with their process physics. Principles of operations of various MEMS devices such as mechanical, optical, thermal, magnetic, chemical/biological sensors/actuators are studied. Topics include: bulk/surface micromachining, LIGA, microsensors and microactuators in multiphysics domain. (3-0) T

EEMF 6383 (MECH 6383 and PHYS 6383) Plasma Science (3 semester credit hours) Theoretically oriented study of plasmas. Topics to include: fundamental properties of plasmas, fundamental equations (kinetic and fluid theory, electromagnetic waves, plasma waves, plasma sheaths), plasma chemistry and plasma diagnostics. Prerequisite: EEGR 6316 or equivalent. (3-0) T

EEMF 7320 Advanced Semiconductor Device Theory (3 semester credit hours) Quantum mechanical description of fundamental semiconductor devices; carrier transport on the submicron scale; heterostructure devices; quantum-effect devices. Prerequisites: EEMF 6320 and EEMF 6321. (3-0) R

EEMF 7V82 Special Topics in Microelectronics (1-6 semester credit hours) May be repeated for credit as topics vary (9 semester credit hours maximum). ([1-6]-0) R