

Electrical Engineering: Solid State Devices & Micro Sys Fabric

[EEMF 5283](#) Plasma Technology Laboratory (2 semester credit hours) Laboratory will provide a hands-on experience to accompany [EEMF 5383](#). Topics to include: Vacuum technology [pumps, gauges, gas feed], plasma uses [etch, deposition, lighting and plasma thrusters] and introductory diagnostics. Recommended Corequisite: [EEMF 7171](#). Corequisite: [EEMF 5383](#). (0-2) R

[EEMF 5320](#) Introduction to Devices and Circuits (3 semester credit hours) This course provides a background in Electrical Engineering for students entering the MSEE program from other fields of science and engineering. Topics include circuit analysis and simulation, semiconductor device fundamentals and operation, and basic transistor circuits. May not be used to fulfill 33 semester credit hours in MSEE degree requirements. Prerequisite: differential equations. (3-0) R

[EEMF 5383](#) ([MECH 5383](#) and [MSEN 5383](#) and [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 6283](#) Plasma Science Laboratory (2 semester credit hours) Laboratory will provide a hands on experience to accompany [EEMF 6383](#). Experiments will include measurements of fundamental plasma properties and understanding of important plasma diagnostics. Recommended Corequisite: [EEMF 7171](#). Corequisite: [EEMF 6383](#). (0-2) T

[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 6323](#) Circuit Modeling of Solid-State Devices (3 semester credit hours) Provide physical insight into the operation of MOSFETs and BJTs, with particular emphasis on new physical effects in advanced devices. Compact (SPICE-level) transistor models will be derived from basic semiconductor physics; common simplifications made in the derivations of model equations will be detailed to provide an appreciation for the limits of model capabilities. Prerequisites: [EEMF 6320](#) and [EEMF 6321](#). (3-0) R

[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 nanofabrication of devices and materials. Advanced photolithography, electron beam lithography, nanoimprint lithography, x-ray lithography, ion beam lithography, soft lithography, and scanning probe lithography, basic resist and polymer science, applications in nanoelectronic and biomaterials. (3-0) Y

[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 7171](#) Current Topics in Plasma Processing (1 semester credit hour) Discussion of current literature on plasma processing; applications, diagnostics, sources, chemistry and technology. May be repeated for credit as topics vary (9 semester credit hours maximum). Must have knowledge of plasma processing technology. Prerequisites: [EEMF 6383](#) or [MECH 6383](#) or [PHYS 6383](#) or equivalent and instructor consent required. (1-0) Y

[EEMF 7320](#) ([MSEN 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