ESM 336 ELECTRONIC MATERIALS (REQUIRED)

Credit: 3

COURSE CATALOG DESCRIPTION:
Solutions of time-dependent non-equilibrium carrier distributions, with applications to optoelectronics and transistors. Doping of semiconductors and IC fabrication technology. Vacuum tube device operation, amplifiers and logic circuits. JFET and MOSFET principles of operation. Implementation of Boolean logic, NAND-only and NOR-only logic. CMOS logic and DRAM memory. Floating-gate memory. CCDs.

PRE-OR COREQUISITE(S): ESG 333 Materials Science II: Electronic Properties

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<th>COURSE LEARNING OUTCOMES</th>
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<td>detailed physical understanding of the basic semiconductor devices used for modern electronic technology</td>
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<td>understanding of the materials and processes used to manufacture devices (diodes, transistors, amplifiers, logic gates, memories)</td>
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COURSE TOPICS
Week 1-2. Equation of Continuity, Time-dependent Non-equilibrium Distributions, Dielectric Response
Week 2. Photoconductivity, LEDs
Week 3-4 Doping Methods-Atomic Diffusion and Ion Implantation
Week 5. Vacuum Tube Devices, Diode and Triode, Applications
Week 6. Junction Field Effect Transistors
Week 7. Ideal MOS Capacitor
Week 8. MOSFETs, Principle of Operation, Amplifier Circuit
Week 8. SRAM and DRAM Memory
Week 9-10. MOSFET Logic, CMOS NAND and NOR
Week 11-12. Fabrication, metal-semiconductor contacts.
Week 13. Floating-gate MOS Memories, CCD Devices

CLASS/ LABORATORY SCHEDULE:

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CURRICULUM
This course contributes 3 credit hours toward meeting the required 48 hours of engineering topics.

**STUDENT OUTCOMES (SCALE 1-3):**

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3 – Strongly supported 2 – Supported 1- Minimally supported

**LEAD COORDINATOR(S) WHO PREPARED THIS DESCRIPTION AND DATE OF PREPARATION:**

Jonathan Sokolov, 5/25/2010