

ESM 336 ELECTRONIC MATERIALS (ELECTIVE)

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

TEXT(S) OR OTHER REQUIRED MATERIAL: J.R. R. Hook, H. E. Hall, Solid State Physics, 2nd Ed., 1993, Wiley, ISBN: 0471928054

COURSE LEARNING OUTCOMES	SOS	ASSESSMENT TOOLS
detailed physical understanding of the basic semiconductor devices used for modern electronic technology	a b e f g i j k	exams, class participation, reports
understanding of the materials and processes used to manufacture devices (diodes, transistors, amplifiers, logic gates, memories)	a b c e f g i j k	exams, class participation, reports

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:

ESM	336	Electronic Materials	LEC	1	TUTH	2:20 PM	3:40 PM
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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):

A	B	C	D	E	F	G	H	I	J	K
3	3	2		3	2	3		3	2	3

3 – Strongly supported

2 – Supported

1- Minimally supported

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

Jonathan Sokolov, 5/25/2010