

ELEG 5233 - Solid State Electronics I

Fall Semester, 1995

Catalog Data: 1995-96 ELEG 5233. Solid State Electronics I. 3 credit hours. Theoretical treatment of crystal structure and quantum and statistical mechanics, thermal properties of crystals, free-electron theory of metals and quantum theory of electronics in periodic lattices prerequisites: ELEG 4203 and PHYS 3613 or consent..

Textbook: John P. McKelvey, SOLID STATE PHYSICS: for Engineering and Materials Science, Krieger Publishing Company, 1993

References: S. M. Sze, Physics of Semiconductor Devices, John Wiley & Sons, 1981
Shyh Wang, Solid-State Electronics, McGraw-Hill Book Company, 1966

Coordinator: J. R. Yeargan, University Professor

Goals: To acquaint students interested in semiconductor devices and integrated circuits with the basic subject areas in solid-state physics. This course is about solid-state physics, not device technology, integrated circuit fabrication, or materials preparation and characterization

Prerequisites by Topic:

1. calculus, differential equations, and matrix algebra
2. elementary physics and chemistry

Topics:

1. Materials Properties.
2. Crystal Lattices.
3. Waves.
4. Diffraction and Xray Analysis.
5. Sound Waves.
6. Dispersion Relations.
7. Lattice Vibrations.
8. Planck's Theory of Blackbody Radiation.
9. Photoelectric Effect.
10. Bohr Model of the Atom.
11. Description of Matter as Waves (De Broglie's relation).
12. Wave Mechanics.
13. Time-Dependence of the Wave Function.
14. Uncertainty Principle.
15. Potential Wells, energy barriers and the wave function.
16. The hydrogen atom.
17. Statistical Mechanics and Phase Space.
18. The Distribution Function and the Density of States.
19. Maxwell-Boltzman, Fermi-Dirace, and Bose-Einstein Statistics.
20. Lattice Specific Heat.
21. Phonons.
22. Thermal Expansion.
23. Exams.

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Computer Usage:

Homework assignments solving and plotting transcendental equations and statistical distributions

Laboratory:

Computer generated curves of distributions versus temperature, etc.

ABET category content as estimated by faculty member who prepared this course description:

Engineering Science:	3 credit hours or 100%.
Engineering Design:	0 credit hours or 0%

Prepared by: _____ Date: _____