ELECTRICAL, COMPUTER, AND SYSTEMS ENGINEERING DEPARTMENT

ABET COURSE SYLLABUS

ECSE-4720 Solid State Physics

Course Catalog Description: An introduction to theoretical and experimental solid state physics. Wave mechanics in the perfect crystal. X-rays, electrons, and phonons. Electrical properties of metals and semiconductors. Qualitative treatment of lattice defects.

Pre-Requisite Courses: PHYS-2100 and PHYS-2510 or equivalent

Co-Requisite Courses: None

Prerequisites by Topic:

1. 1st and 2nd year UG Physics
2. Calculus and differential equations
3. Basic Quantum Mechanics

Textbook: (and/or other required material) C. Kittel, *Introduction to Solid State Physics*, 8th Edition, Publisher: John Wiley and Sons, Inc., ISBN: 0-471-41526-X

References:

1. J.S. Blakemore, *Solid State Physics, 2nd Edition*
2. N.W. Ashcroft and N.D. Mermin, *Solid-State Physics*

Course Coordinator: Partha Dutta

Overall Educational Objective: To present in one course a general understanding of the fundamental concepts in solid state physics and apply the basic principles to scientific and engineering problem solving.

Course Learning Outcomes:

1. Learn the fundamental principles, generalizations, and theories of solid-state physics
2. Gain factual knowledge relating to solid-state physics, including terminology, classifications, methods, and trends
3. Apply course material to improve thinking, problem solving, and decisions

How Course Outcomes are Assessed:

Weekly Homework:40% of the total grade
Weekly Quizzes: 40% of the total grade
Final Exam: 20% of the total grade

Relation to EE/CSE/EPE Outcomes

N = none
M = moderate
H = high

Outcome	Level	Demonstrate Proficiency
	N, M, H	e.g. Exams, projects, HW
Mathematics, science and engineering	H	Quiz, HW, Exam
Basic disciplines in Electrical Engineering	M	HW, Quiz
Depth in Electrical Engineering	H	HW, Quiz
Basic disciplines in Computer & Sys. Eng.	N	
Depth in Computer and Systems Eng.	N	
Electromagnetics, electromechanics, power semiconductors	N	
Power system behavior	N	
Electrical energy conversion	N	
Conduct experiments and interpret data	M	HW
Identify, formulate and solve problems	M	HW, Quiz
Design a system, component or process	N	
Communicate in written and oral form	M	HW, Quiz, Exam

Function as part of a multi-disciplinary team	N	
Preparation for life-long learning	M	HW
Ethical issues; safety, health, public welfare	N	
Humanities and social sciences	N	
Laboratory equipment and software tools	N	
Variety of instruction formats	M	In-class discussions

Topics Covered:
(number of hours or classes for each)

1. Introduction to Solids (2.5 hours)
2. Bonding in Solids (2.5 hours)
3. Crystal Structure (2.5 hours)
4. Free Electron Fermi Gas (2.5 hours)
5. Energy Bands and Fermi Surfaces (2.5 hours)
6. Semiconductors (2.5 hours)
7. Thermal Properties (2.5 hours)
8. Dielectrics Properties (2.5 hours)
9. Magnetic Properties (2.5 hours)
10. Superconductivity (2.5 hours)
11. Optical Properties (2.5 hours)
12. Crystalline Defects (2.5 hours)

Computer Usage: Only for basic mathematical calculations, plotting graphs, etc.

Laboratory Experiences: None

Design Experiences: None

Independent Learning Experiences: None

Class/Lab Schedule: Monday & Thursday, 12.00-1.30 PM

Contribution to the Professional Component:

(a) College-level mathematics and basic sciences:	2 credit hours
(b) Engineering Topics (Science and/or Design):	2 credit hours
(c) General Education:	0 credit hours

Prepared by:	Partha Dutta
Date:	9/30/2005