MATSCEN 6747 (Proposed): Structure and Defects in Materials

Course Description
Structure and defects in crystalline and amorphous solids.

Prior Course Number: 747
Transcript Abbreviation: Struc Defects Mat
Grading Plan: Letter Grade
Course Deliveries: Classroom, Less than 50% at a distance
Course Levels: Graduate
Student Ranks: Masters, Doctoral
Course Offerings: Autumn
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Grad standing in MatSc&En or permission of instructor. Not open to students with credit for MSE 745 or 747.
Exclusions:
Cross-Listings:

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code:
Subsidy Level:

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

General Information

Course is a required core course for the MSE doctoral program.

Course Goals

Introduce students to the basics of crystallography and structural imperfections in crystalline and non-crystalline materials.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to lattice geometry, unit cells, planes and directions, Miller indices, zones and the zone rule, and symmetry elements.	6.0							
Crystal systems, space lattices (Bravais lattices), the stereographic projection and point groups.	8.0							
Stereographic projection and point groups (continued), crystal systems.	4.0							
Crystal systems (continued), Laue groups, space groups, crystal structures.	4.0							
Tensors, and their relation to crystal structures - Neumann's Principle.	4.0							
Stress, strain, and elasticity. Glide and dislocations.	4.0							
Dislocations in crystals, point defects.	4.0							
Interfaces in materials.	6.0							
Interfaces in materials - topological theory of interfacial defects.	2.0							
Mid-term and final examinations.	4.0							

Representative Assignments

Homework problems assigned from the textbook, or by the instructor.
Group exercises involving computer programming for crystallographic calculations, or visualization of crystal structures.

Grades

Aspect	Percent
Mid-term examination	45%
Final examination	45%
Homework and participation	10%

Representative Textbooks and Other Course Materials

Title	Author
Structure of Materials: an Introduction to Crystallography, Diffraction, and Symmetry	M. de Graef & M. E. McHenry
Space Groups for Solid State Scientists	G. Burns & A. M. Glazer

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
	a	An ability to apply knowledge of mathematics, science, and engineering.
	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
	c	An ability to design a system, component, or process to meet desired needs.
	d	An ability to function on multi-disciplinary teams.
	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
	g	An ability to communicate effectively.

Course Contribution		College Outcome
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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