

MATSCEN 6715: Principles of the Characterization of Materials

Course Description

Fundamentals of beam-solid interactions and their application to the characterizing the structure and composition of materials. The emphasis of this course will be on techniques utilizing X-ray and electron probes.

Prior Course Number: 715

Transcript Abbreviation: Prin Char Mat

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: Autumn, Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

Course Length: 14 Week

Credits: 2.0

Repeatable: No

Time Distribution: 2.0 hr Lec

Expected out-of-class hours per week: 4.0

Graded Component: Lecture

Credit by Examination: No

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: Math 415 or grad standing in MatSc&En or permission of instructor.

Exclusions: Not open to students with credit for MATSCEN-715

Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: Yes

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: 14.1801

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Goals

The emphasis of this course will be on techniques utilizing X-ray and electron probes.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to X-Ray Diffraction - Generation of X-Rays - Basic Diffraction Theory - Powder Diffractometry								
Introduction to Transmission Electron Microscopy - Electron interaction with matter - Electron diffraction - Imaging modes and defect analysis								
Introduction to Scanning Electron Microscopy - Electron generation - Detectors and Imaging modes - Crystallographic analysis with Orientation Microscopy								
Spectroscopy Using Electron Probes								
Spectroscopy Using Photon Probes								
Spectroscopy Using Ion Probes								

Grades

Aspect	Percent
Midterm	45%
Final	45%
Homework	10%

Representative Textbooks and Other Course Materials

Title	Author
<i>Transmission Electron Microscopy: A Textbook for Materials Science</i>	D. B. Williams and C. B. Carter, Plenum Press, New York (2nd edition 2009)

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.
	i	A recognition of the need for, and an ability to engage in life-long learning.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	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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