

MATSCEN 7835 (Proposed): Point Defects in Crystalline Materials

Course Description

A thermodynamic and electrochemical treatment of the formation, concentrations, mobilities, and interactions of atomic, ionic, and electronic point defects in materials at high temperatures

Prior Course Number: 835

Transcript Abbreviation: PntDefCrystalMat

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Graduate

Student Ranks: Masters, Doctoral

Course Offerings: 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: Yes

Exam Types: EM Tests via Office of Testing

Admission Condition: No

Off Campus: Never

Campus Locations: Columbus

Prerequisites and Co-requisites: 730 and 732 or permission of instructor.

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

Course Goals

Student will learn how point defects influence physical, chemical and electrochemical properties of solids by applying basics of thermodynamics and transport phenomena.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Structure, Thermodynamics and Point Defects	6.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Transport in Compounds	8.0							
Solid Electrolytes and Electrochemistry	6.0							
Modeling of Transport Behavior in Heterogeneous Materials	8.0							

Grades

Aspect	Percent
Homework Assignment	40%
Critical Analysis of an Assigned Paper	10%
Term Paper (written - 25%; presentation - 25%)	50%

Representative Textbooks and Other Course Materials

Title	Author
<i>Reference book: The Chemistry of Imperfect Crystals (2nd Ed.)</i>	F.A. Kroger
<i>Reference Book: Nonstoichiometry, Diffusion and Electrical Conductivity</i>	P. Kofstad
<i>Reference Book: Thermodynamics of Alloys</i>	C. Wagner
<i>Reference Book: Solid State Reactions (2nd Ed.)</i>	H. Schmalzried
<i>Reference Book: Impedance Spectroscopy</i>	J.R. McDonald
<i>Refernce Book: The Defect Chemistry of Metal Oxides</i>	D.M. Smyth

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.
	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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