

MATSCEN 6735 (Approved): Corrosion Science and Materials Electrochemistry

Course Description

Electrochemistry fundamentals, corrosion thermodynamics and kinetics, experimental approaches, corrosion phenomenology, corrosion control strategies. Nonmetallic material degradation. Electrochemistry of batteries, fuel cells, electrodeposition.

Prior Course Number: 735

Transcript Abbreviation: CorrSci

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: 3.0 hr Lec

Expected out-of-class hours per week: 3.0

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

Exclusions: Not open to students with credit for MATSCEN-735

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: 14.1801

Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Goals

Provide fundamental knowledge of electrochemistry
Provide understanding of controlling factors for metal corrosion.
Provide understanding of experimental approaches for measuring corrosion rate.
Provide awareness and understanding of forms of corrosion and corrosion phenomenology such as passivity and localized corrosion, galvanic corrosion, dealloying, environmental cracking.
Provide approaches for corrosion prevention and control such as coatings, inhibitors, cathodic protection, alloying.

Provide knowledge of degradation of non-metallic materials, such as polymers, ceramics, and semi-conductors.
Use electrochemical understanding to discuss aspects of electrodeposition, batteries, and fuel cells.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Fundamentals of Electrochemistry	3.0							
Corrosion Thermodynamics	3.0							
Electrochemical Kinetics	3.0							
Mixed potential theory and corrosion rate	6.0							
Corrosion rate measurement methods	5.0							
Corrosion phenomenology	6.0							
Corrosion prevention and control approaches	6.0							
Nonmetallic material degradation	3.0							
Batteries, Fuel Cells, Electrodeposition	7.0							

Representative Assignments

homework problems
analysis of lab data
term paper

Grades

Aspect	Percent
2 Exams	67%
Term Paper	33%

Representative Textbooks and Other Course Materials

Title	Author
<i>Corrosion and Surface Chemistry of Metals</i>	Dieter Landolt

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.

Course Contribution		College Outcome
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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