

# MATSCEN 5951 (Approved): Corrosion and Failure Analysis

## Course Description

Course covers fundamentals of environmental degradation of materials, corrosion phenomenology and corrosion prevention strategies. Also methodologies for root cause analysis of failed components.

**Prior Course Number:** MSE662

**Transcript Abbreviation:** Corr Fail Analysis

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Undergrad, Graduate

**Student Ranks:** Junior, Senior, Masters, Doctoral, Professional

**Course Offerings:**

**Flex Scheduled Course:** Never

**Course Frequency:** Every Year

**Course Length:** 14 Week

**Credits:** 3.0

**Repeatable:** No

**Time Distribution:** 2.0 hr Lec, 1.0 hr Lab

**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:** Sr or grad standing in engineering or permission of the 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:** 14.3101

**Subsidy Level:** Baccalaureate Course

## Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

## Course Goals

Understand principles behind the environmental degradation of materials. Know forms of corrosion and methods for prevention and control. Gain experience in experimental approaches for the evaluation of corrosion susceptibility.
Learn methodologies, approaches and tools for failure analysis of materials.

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction and electrochemical basis of corrosion	2.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Thermodynamics, Nernst Eqn., and Pourbaix diagrams	4.0							
Kinetics of corrosion, polarization, mixed potential theory	4.0		2.0					
Experimental methods for corrosion rate: Weight loss, Tafel extrapolation linear polarization	4.0		3.0					
Corrosion mitigation methods: alloying, coatings, inhibitors, sacrificial protection, cathodic protection	4.0		1.0					
Corrosion phenomenology: passivity, localized corrosion, galvanic corrosion, environmental cracking, atmospheric corrosion, oxidation	6.0		4.0					
Failure analysis methodology and fractography	4.0		2.0					

## Representative Assignments

homework problems assigned from textbook
exams
lab reports

## Grades

Aspect	Percent
Homework	10%
Lab Reports	30%
exams	60%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Principles and Prevention of Corrosion</i>	Denny Jones

## 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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