MATSCEN 3332 (Proposed): Materials Science and Engineering Lab II

Course Description

Laboratory experiments related to materials application and performance. Advanced experimental techniques and analysis in these areas. Technical writing skills at fully professional level.

Prior Course Number: MSE581
Transcript Abbreviation: MatScEng Lab2
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Junior
Course Offerings: Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 2.0
Repeatable: No
Time Distribution: 3.0 hr Lab
Expected out-of-class hours per week: 3.0
Graded Component: Laboratory
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: MATSCEN 2241 and MATSCEN 2331 and MATSCEN 2251 and enrollment as MATSCEN-BS student; or permission of instructor
Exclusions: Not open to students with credit for BOTH MSE 581.02 and MSE 581.03
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: No

Subject/CIP Code: 14.3101
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Goals

Ability to conduct advanced experiments in materials application properties.
Ability to conduct advanced experiments in materials performance.
Skills in analysis of limited data that is that is difficult to reproduce.
Experimental design to obtain systematic data at minimal cost/effort.

Experimental data analysis through finite element simulations.
Ability to write effective technical reports that contain a critical analysis of the state-of-the-art, the experiment, recommendations and perspectives.
Building students' portfolio of important accomplishments.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Mechanical strength, deformation and and reliability.			12.0					
Mechanical property measurement.			6.0					
Structural evolution during annealing, sintering and deformation.			6.0					
COMSOL multi-physics finite element data analysis.			6.0					
Chemical and mechanical degradation: (stress) corrosion and fatigue. Effect of surface treatments.			6.0					
Electrochemical characterization and interfacial transfer phenomena.			6.0					

Representative Assignments

Metal casting and heat treatment, deformation properties. Microstructural characterisation and stereology analysis during processing and deformation.
High temperature oxidation of, and binary diffusion in metals.
Structural dense ceramics and composites from sub-micron powders, and synthetic nano-particles. Effect of microstructure. Mechanical strength and toughness. Weibull analysis and fractography. Microstructural characterisation and stereology analysis.
Metallic corrosion, corrosion rate and Faraday's law. Application of standardized exposure protocols. Passivation.
Functional energy conversion and storage materials: fuel cells, batteries, chemisorbents, and separation membranes. Relation between 1) composition and structure, 2) equilibrium and transport properties.

Grades

Aspect	Percent
Attendance, self-management and attitude.	10%
Topical quizzes.	15%
Reporting.	75%

Representative Textbooks and Other Course Materials

Title	Author
MSE Guidelines for Technical Writing	W.L. Chrisman, J.R. Pepperney, and H. Verweij
Materials Science and Engineering Labs Student Guide	M.C. Schillo, H. Verweij and other, future contributors
Background material, videos, models and templates on Carmen	Compliled by H. Verweij and other, future contributors

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.

Course Contribution		College Outcome
	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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