

# MATSCEN 3331 (Approved): Materials Science and Engineering Lab I

## Course Description

Laboratory experiments related to materials processes, and properties. Introduction to experimental techniques used in materials fields. Data analysis, presentation and technical writing skills.

**Prior Course Number:** MSE581

**Transcript Abbreviation:** Mat Sc Eng Lab 1

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Undergrad

**Student Ranks:** Junior

**Course Offerings:** Autumn

**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:** MSE 2331 or permission of instructor

**Exclusions:**

**Cross-Listings:**

**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 simple experiments in materials synthesis, processing and process control.
Ability to conduct simple experiments in materials continuum property measurement.
Skills in reduction, analysis and presentation of redundant and less accurate data.
Computer data acquisition, analysis and process control.
Ability to write, clear, concise, complete and correct technical reports.
Building students' portfolio of important accomplishments.

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Materials synthesis and processing.			6.0					
Transport: modes, species, continuity. Solid state, and irreversible thermodynamics.			6.0					
Process control for temperature, atmosphere, and vacuum.	3.0		6.0					
LabVIEW instrumentation.	3.0		6.0					
Continuum properties and their analysis in time and frequency domain.			6.0					
Data reduction, derivations, error analysis and statistics.	6.0		6.0					
Document formatting and processing.			6.0					

## Representative Assignments

Temperature measurement, control and heat propagation in thermal processing. Thermal conductivity of solids.
Ceramic powder synthesis for functional materials, for example $\text{YBa}_2\text{Cu}_3\text{O}_{6+y}$ superconductor.
Irradiation of poly-ethylene leading to embrittlement, and changes of glass transition temperature, color, and thermal properties.
Temperature dependence of conductivity in semi-conductors, metals, insulators, ionic conductors. Effect of composition and structure, DC vs AC measurements.
Assessment of elasticity, anelasticity and mechanical friction in solids. Relation with composition and structure. Acoustic emission and frequency response analysis.

## Grades

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

## Representative Textbooks and Other Course Materials

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

Course Contribution	College Outcome	
	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.

**Prepared by:** Hendrik Verweij