

MSE 4022: Materials Laboratory II (required)

Catalog Description: (1-3-2)

Prerequisites: MSE 2021 – Materials Characterization

Processing, structure, properties relationships are explored through a series of hands-on experiments. Instruction on basic laboratory skills, safety, statistical analysis of data, use of laboratory notebooks and technical report writing.

Text Book & Supplementary Materials

No text book is specified as the required text for this course. Supplementary materials supplied include:

- Summarized operating instructions for multiple equipment,
- Summary of test methods with standard data acquisition tables,
- Sample calculations,
- Instructions for notes taking and preparation of technical reports,
- Overall and equipment specific safety guidelines, and
- Selected research publications.

The research publications supplied are carefully chosen to aid the discussion of experimental results and to logically connect the observed trends with the past work. Each student is required to document his/her own lab experience in a separate note book and submit original copy of the notes for grading at the end of the session.

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Specific Course Information

Brief Description: This course focuses on developing effective materials laboratory practices and technical communication. Within this framework, students, divided into multiple groups, will practice materials science fundamentals dealing with fabrication, characterization and data analysis. The course will be taught in three sections to cover polymers, metals and ceramics

Pre-requisites: MSE 2021

Nature of Course: Required Core

Topics Covered

Polymers

- Polymer extrusion/fabrication
- Melt flow behavior of polymers
- Thermal characterization of polymers
- Structural analysis of polymers

Metals

- Casting
- Cold and hot drawing
- Homogenization
- Ageing
- Grinding and Polishing
- Imaging for microstructural analysis
- Hardness testing

Ceramics

- Dry and wet fabrication
- Sintering
- Measurement of particle size and density
- Measurement of the properties of sintered materials

Correlation between Course Outcomes and Student Outcomes:

Course Outcomes	Student Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
1. Enable students to work efficiently in self-managed groups				X			X	X			
2. Provide an opportunity to test and verify basic concepts learned in multiple courses	X							X			X
3. Provide an opportunity to analyze data and make correct interpretations	X	X	X		X			X			X
4. Enhance ability in oral and written communication, including technical communication	X				X		X				X
5. Impart training to optimally choose materials and processes to suit specific end-use requirements	X	X	X		X			X	X	X	X
6. Expose to multiple learning resources and help understand their value for professional growth	X	X	X		X			X	X	X	X
7. Put emphasis on honesty, discipline, hard work and sincerity						X			X		
8. Give ability to interpret personal work in the context of immediate past and future			X			X				X	
Entire Course	3	2	2	2	2	1	1	0	1	0	3
0 = None or insignificant; 1 = Some; 2 = Moderate; 3 = Strong											

School of Materials Science and Engineering Student Outcomes:

- 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 within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

- d) an ability to function on multidisciplinary 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, economic, environmental, 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