

MSE 3225: Rheology (required)

Catalog Description: (3-0-3)

Prerequisites: ME 3340 Fluid Mechanics or ChBE 3200 Transport Processes I

Introduction to non-Newtonian fluid mechanics and rheology.

Textbook: Faith A. Morrison, *Understanding Rheology*, 1st Edition, Oxford University Press, 2001.

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Topics Covered:

13. Vectors and Tensors
14. Newtonian Fluid Mechanics
15. Standard Flows
16. Material Functions
17. Experimental Data
18. Generalized Newtonian Fluid
19. Linear Viscoelasticity
20. Advanced Constitutive Modeling
21. Rheometry
22. Current Topics in Rheology

Course Outcomes:

At the end of this course, students will be able to:

1. Construct tensors to describe flows
2. Explain how rheological properties are measured
3. Critically assess the quality of experimentally measured data
4. Apply viscoelastic property data to explain material behavior
5. Choose and apply constitutive models to flows and experimental data
6. Identify how rheology is used outside of an academic setting

Correlation between Course Outcomes and Student Outcomes:

Course Outcomes	Student Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
1. Construct tensors to describe flows	x										
2. Explain how rheological properties are measured		x					x				x
3. Critically assess the quality of experimentally measured data		x									
4. Apply viscoelastic property data to explain material behavior		x									
5. Choose and apply constitutive models to flows and experimental data	x	x			x						
6. Identify how rheology is used outside of an academic setting											x
Entire Course	2	3	0	0	1	0	0	0	0	0	1
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