MSE 3225: Rheology

Credit hours and contact hours: 3-0-0-3

Instructor: Meisha Shofner

Textbook: Faith Morrison, *Understanding Rheology,* Oxford University Press, 2001.

Specific course information

Catalog description: Introduction to non-Newtonian fluid mechanics and rheology.

Prerequisites: CHBE 3200 – Transport Processes I or ME 3340 – Fluid Mechanics or MSE 3210 – Transport Phenomena

Course: Selected Elective

Specific goals for the course

Outcomes of instruction:

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

Student Outcomes:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

(3) An ability to communicate effectively with a range of audiences.

(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Topics covered:

1. Vectors and Tensors
2. Newtonian Fluid Mechanics
3. Standard Flows

4. Material Functions
5. Experimental Data
6. Generalized Newtonian Fluid
7. Linear Viscoelasticity
8. Advanced Constitutive Modeling
9. Rheometry
10. Current Topics in Rheology

Correlation between Outcomes of Instruction and Student Outcomes:

Outcomes of Instruction	Student Outcomes						
	1	**2**	**3**	**4**	**5**	**6**	**7**
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	
6. Identify how rheology is used outside of an academic setting					X		

School of Materials Science and Engineering Student Outcomes:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
(3) An ability to communicate effectively with a range of audiences.
(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.