ENGR 4 - Engineering Materials

Fall 2022
Section #51004

Class:
Class meetings on Mondays/Wednesdays, 2:30-3:45pm, PHY-77

Instructor:
Dr. John Heathcote
Office:
PHY-78
Phone:
(559) 494-3000 ext. 3215
Cell Phone:
(559) 643-5469
e-mail:
john.heathcote@reedleycollege.edu

Office Hours:
Mondays, 11:00-11:50am
Tuesdays, 12:00-1:50pm
Wednesdays, 11:00-11:50am
Fridays, 11:00-11:50am

If you cannot make regular office hours, feel free to make an appointment.

Welcome to ENGR 4, an overview of the science and engineering behind materials! This is a wide-ranging course that will cover the structures, properties, processing techniques, and applications of metals, ceramics, polymers, composites and advanced materials. No matter which area of engineering you are pursuing, you will need to understand the materials with which you are working. From this course you will obtain a fundamental understanding of these materials.

Prerequisites: CHEM 1A, PHYS 4A

Catalog Description: This is an introductory course on the properties of engineering materials and their relation to the internal structure of materials. Topics include atomic structure and bonding; crystalline structures; phases and phase diagram; metals; polymers; ceramics; composites; mechanical deformation and fracture; structural control and influence of properties; materials naming and designating systems; and electrical properties.

Textbook: **Foundations of Materials Science and Engineering**, 6th Edition, William Smith and Javad Hashemi, McGraw-Hill

YOU DO NOT NEED TO PURCHASE THIS TEXTBOOK. IT IS AVAILABLE FOR A FREE SEMESTER-LONG CHECKOUT FROM THE REEDLEY COLLEGE LIBRARY. JUST ASK AT THE FRONT DESK.

Grading:

There will be an assessment posted on Canvas for each chapter that we cover from the textbook. The assessments will be timed quizzes or projects. Each chapter assessment will be worth 20 points.

In addition, there will be three exams (2 midterms and the final). Each will cover the material from the preceding chapters. Each exam will be worth 100 points.

Retakes: You will be given the opportunity to retake any assessment (quiz, project, or exam) – one retake per assessment. I encourage you to learn from any mistakes you make from your first attempt and to improve your performance.

Grading Scale:

The overall grade will be based on the overall percentage of possible points that you earn from the chapter assessments and exams. (There will be approximately 580 total possible points.)

90-100%	A
80-89.9%	B
70-79.9%	C
60-69.9%	D
<60%	F

Accommodations for Students with Disabilities:
If you have a verified need for an academic accommodation or materials in alternate media (i.e., Braille, large print, electronic text, etc.) per the Americans with Disabilities Act (ADA) or Section 504 of the Rehabilitation Act, please contact me as soon as possible.

Add Date:	Friday, August 26	Last day to add a course
Drop Date:	Friday, October 7	Last day to drop this course
Holidays:	Monday, September 5	Labor Day
	Friday, November 11	Veterans' Day
	Thursday-Friday, November 24-25	Thanksgiving Holiday
Final:	Monday, December 5, 2:00-3:50pm	
Final Retake:	Wednesday, December 7, 2:00-3:50pm	

Student Learning Outcomes:

Upon completion of this course, students will be able to:

1. classify crystal structures and crystal imperfections and determine their effects on material properties.
2. use mechanical behavior data for a given material to predict a material's behavior under a certain load condition.
3. interpret phase diagrams and predict material microstructures created by different heat treatments.
4. identify the properties of the various classes of materials and assess the proper material to be used in certain applications.

Objectives:

In the process of completing this course, students will:

1. define the types of bonds and list their properties.
2. classify the various crystal structures and use crystallographic techniques to describe their features.
3. describe crystalline imperfections and analyze their influence on material behavior.
4. analyze stress-strain curves and calculate materials' reactions to various stress conditions.
5. differentiate elastic and plastic deformation.
6. describe the mechanisms for strengthening materials.
7. calculate failure loads of materials based on fracture and fatigue.
8. calculate materials' reactions under high temperature loading.
9. interpret phase diagrams and solve problems based upon them.
10. use phase diagrams to predict microstructural development in materials under heat treatment.
11. analyze the properties of the various classes of materials.
12. categorize and investigate the variety of materials within each class of materials.
13. outline and apply the electrical and corrosive properties of materials.
14. use reference data regarding the properties, processing, and performance characteristics of materials to recommend appropriate materials to meet engineering design criteria.

Tentative Course Schedule: (subject to change) --

	Monday	Wednesday
Week 1	Chapter 1	Chapter 2
Week 2	Chapter 2 / Chapter 3	Chapter 3
Week 3	Chapter 4	Chapter 4
Week 4	Chapter 5	Chapter 5
Week 5	LABOR DAY HOLIDAY	Chapter 6
Week 6	Chapter 6	Chapter 6
Week 7	**Midterm #1 (Chapters 1-5)**	Chapter 7
Week 8	Chapter 7	Chapter 8
Week 9	Chapter 8	Chapter 9
Week 10	Chapter 9	Chapter 10
Week 11	Chapter 10	Chapter 10
Week 12	Chapter 11	Chapter 11
Week 13	**Midterm #2 (Chapters 6-10)**	Chapter 12
Week 14	Chapter 12	Chapter 13
Week 15	Chapter 13	Chapter 14
Week 16	Chapter 14	Chapter 14
Week 17	Prepare for Final	Prepare for Final
Week 18	**Final (Chapters 11-14)**	**Optional Final Retake**