

ENGR 4L - Engineering Materials Laboratory

Fall 2023

Section #51069

Class:

Face-to-face: Meets on Tuesdays from 2:00-4:50pm in PHY-77

Instructor:

Dr. John Heathcote

Office:

PHY-78

Phone:

(559) 494-3000 ext. 3215

Cell:

(559) 643-5469

e-mail:

john.heathcote@reedleycollege.edu

Office Hours:

MWF, 11:00-11:50am

TTh, 1:00-1:50pm

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

Course Communication Policy:

Outside of our weekly class meetings, communication will take place through our Canvas site. I will send Canvas messages regularly to keep you updated on the progression of the class and any important announcements. You will need to read these to stay informed about the class.

Please contact me with any questions or concerns you have about this class. Contact me through a Canvas message. I will reply within 24 hours on weekdays. I may be able to respond on weekends as well, but it is not guaranteed. (If I do not respond within 24 hours, please resend your message.)

Prerequisites:

CHEM 1A, PHYS 4A

Corequisite:

ENGR 4 (previously or concurrently)

Introduction:

Welcome to the Engineering Materials Laboratory! This is a fun, hands-on companion course to the ENGR 4 lecture course. You will have the opportunity to perform lab experiments that will bring the textbook material to life. While doing so, you will also work on developing your technical writing skills in your laboratory reports.

Catalog Description:

This is a laboratory course in which students investigate the structure, properties, and performance of engineering materials, with topics including crystal structures, metallography, cold working and heat treatment, mechanical behavior, ductile and brittle failure, toughness, fatigue, corrosion, and properties of semiconductor devices.

Required Text:

None (However, the topics of this laboratory course will coincide with the topics covered in ENGR 4 and in its textbook **Foundations of Materials Science and Engineering**, 6th Edition, William Smith and Javad Hashemi, McGraw-Hill)

Grading:

Grading will be based upon the total points earned by students through the semester. Activities that will earn points will include lab worksheets, formal lab reports, and a final presentation.

Grading Scale:

Grades will be determined from the percentage of points earned by a student from the total possible points.

90-100%	A
80-89.9%	B
70-79.9%	C
60-69.9%	D
0-59.9%	F

Laboratory Worksheets and Reports:

You will perform laboratory activities and then report your results. These results may be reported as completed worksheets or as formal lab reports.

Final Presentation:

You will research an engineering material of your choice and give a short presentation to the class at the end of the semester.

Late Work Policy:

Please do your best to keep up with this course. You will struggle if you fall behind in the class. However, I do understand that circumstances do come up. I will still accept work after the deadline, but I will work with you if this becomes a problem.

Attendance and Drop Policy:

A student who do not attend the first class meeting will be considered a "No Show" for the class and will be dropped. Students who are absent for two weeks (not necessarily in a row) will be dropped from the class.

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.

Cheating and/or plagiarism:

Cheating and/or plagiarism will not be tolerated. A student will receive no credit for the assignment if in the opinion of the instructor the individual has cheated. Further problems with cheating or plagiarism may cause a report to the Dean of Students.

Add Date:	Friday, August 25	Last day to add a course
Drop Date:	Friday, October 6	Last day to drop this course
Holidays:	Monday, September 4	Labor Day
	Friday, November 10	Veterans' Day
	Thursday-Friday, November 23-24	Thanksgiving Holiday

Student Learning Outcomes:

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

1. measure material properties and/or evaluate processing treatments using standard materials testing equipment and techniques.
2. write laboratory reports that communicate the collection, analysis, and interpretation of experimental data according to professional engineering standards.

Course Objectives:

In the process of completing this course, students will:

1. model various crystal structures found in metals and nonmetals
2. model crystal imperfections and analyze their effect on material properties
3. measure stress-strain behavior for metals, polymers and ceramics
4. investigate ductile and brittle fracture and identify the type of failure from fracture surfaces
5. determine the relative toughness of various materials through impact testing
6. evaluate fatigue behavior of metals
7. analyze equilibrium phase diagrams and predict phases and microstructure present under certain conditions
8. investigate the effect of various materials processing techniques (such as strain hardening, recrystallization, and precipitation hardening) on the structure and properties of metals
9. assess the corrosion resistance of various materials under certain environmental conditions
10. measure the behavior of semiconductor devices

Course Outline: (subject to change)

Lab Dates	Topics
Tuesday, August 8 th	Types of Materials / Atomic Bonding
Tuesday, August 15 th	Metal Crystal Structures
Tuesday, August 22 nd	Structural Imperfections
Tuesday, August 29 th	Hardness and Diffusion
Tuesday, September 5 th	Tensile Properties of Metals
Tuesday, September 12 th	Steel Heat Treatments
Tuesday, September 19 th	Mechanical Property Analysis
Tuesday, September 26 th	Fatigue and Impact Toughness
Tuesday, October 3 rd	Creep
Tuesday, October 10 th	Phase Diagrams
Tuesday, October 17 th	Phase Transformations
Tuesday, October 24 th	Polymers
Tuesday, October 31 st	Ceramic Structures
Tuesday, November 7 th	Electrical Resistivity
Tuesday, November 14 th	Semiconductor Devices
Tuesday, November 21 st	Creativity Lab
Tuesday, November 28 th	Final Presentations