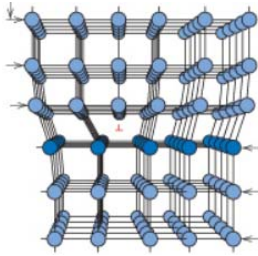


## Engineering 4 – Section #50093



- Instructor:** Dr. John Heathcote      **Class Times:** All Online
- Office:** Reedley College, FEM-1B (in Math Center, in FEM Building)
- Phone:** 638-3641 ext. 3215
- e-mail:** [john.heathcote@reedleycollege.edu](mailto:john.heathcote@reedleycollege.edu)
- Office Hours:** Mondays and Wednesdays, 12:00-1:50 pm  
Fridays, 10:00-10:50 am  
*Or feel free to stop by or make an appointment*
- Required Text:** Materials Science and Engineering, An Introduction, 8<sup>th</sup> Edition, William D. Callister, Jr., Wiley, **with WileyPLUS Access**

**Catalog Description:** 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 diagrams, metals, polymers, ceramics, composites, mechanical deformation and fracture, structural control and influence of properties, materials naming and designating systems, electrical properties, and magnetic properties.

**Online Course Presentation:** This course is being taught as a fully-online course. That means that all lecture presentations, homework assignments and other class activities will be via the Blackboard class page and the WileyPLUS website.

Typically, there will be two due dates each week. By that date, students are expected to read the appropriate sections of the textbook, view any online materials, complete any homework problems or other activities, and/or take part in online discussions.

<b>Grading:</b>	20%	Online Quizzes
	60%	Online Homework Assignments and Discussions
	20%	Written Homework Assignments

**Online Quizzes:** There will be an online quiz following the conclusion of most chapters. These will check your understanding of the concepts and calculations from that chapter. During the quiz, you will be able to use your notes, your book, and any online resources. However, there may be a time limit on the quizzes. That means that you will not have the time to learn the material during the quiz. You will need to have a good understanding of the chapter before you get started.

Quiz questions will be multiple choice, fill-in-the-blank, short answer, or essay questions. They may involve calculations or be conceptual.

**Online Homework Assignments:** As a way of learning the material, students will have regular online assignments using WileyPLUS. Deadlines are very important. Late work will not receive full credit.

**Online Discussions:** To foster a learning community in our online class, we will occasionally have online discussions based upon the topics that we are learning. To receive credit for these discussions, you will need to post statements on the topic and reply to other students' posts. Good grades will be given to students who contribute the most to the discussions.

**Written Homework Assignments:** There will occasionally be assignments that are not the typical online homework assignment. Instead of performing these assignments through WileyPLUS website, you will be given a more open-ended assignment that you will submit with a Word file, spreadsheet file, or some other format. These assignments may be designed to go deeper into certain topics or to apply those topics.

**Communication:** Since we do not have an official meeting each week, it is important that you feel comfortable contacting me with any questions. Please feel free to call me, email me, come by my office hours, or post a comment on the Blackboard discussion board.

<b>Grading Scale:</b>	90-100%	A
	80-89%	B
	70-79%	C
	60-69%	D
	<60%	F

<b>Add Date:</b>	Friday, August 30 <sup>th</sup>	Last day to add a course
<b>Drop Date:</b>	Friday, October 11 <sup>th</sup>	Last day to drop this course
<b>Holidays:</b>	Monday, September 2 <sup>nd</sup>	Labor Day
	Monday, November 11 <sup>th</sup>	Veterans' Day
	Thursday-Friday, November 28 <sup>th</sup> and 29 <sup>th</sup>	Thanksgiving Holiday

### **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.

*There are special challenges when a course is offered online. Stay disciplined to do what is required of you. Keep up with every deadline!!! Do not procrastinate!*

**Course Outline:** (subject to change) -- Assignments are due by 1PM on the day shown.

<b>Due Dates</b>	<b>Textbook Chapter</b>	<b>Topics</b>
Friday, August 16 <sup>th</sup>	1	Introduction
Tuesday, August 20 <sup>th</sup>	2	Atomic Bonding
Friday, August 23 <sup>rd</sup>	Chapters 1 and 2 Review	
Tuesday, August 27 <sup>th</sup>	3A	Crystal Structures
Friday, August 30 <sup>th</sup>	3B	Crystallography
Tuesday, September 3 <sup>rd</sup>	Chapter 3 Review	
Friday, September 6 <sup>th</sup>	4A	Imperfections
Tuesday, September 10 <sup>th</sup>	4B	Imperfections
Friday, September 13 <sup>th</sup>	5	Diffusion
Tuesday, September 17 <sup>th</sup>	Chapter 4 and 5 Review	
Friday, September 20 <sup>th</sup>	6A	Stress and Strain
Tuesday, September 24 <sup>th</sup>	6B	Elastic and Plastic Deformation
Friday, September 27 <sup>th</sup>	6C	Mechanical Properties
Tuesday, October 1 <sup>st</sup>	Chapter 6 Review	
Friday, October 4 <sup>th</sup>	7A	Dislocations/Plastic Deformation
Tuesday, October 8 <sup>th</sup>	7B	Strengthening Mechanisms
Friday, October 11 <sup>th</sup>	8A	Fracture
Tuesday, October 15 <sup>th</sup>	8B	Fatigue / Creep
Friday, October 18 <sup>th</sup>	Chapters 7 and 8 Review	
Tuesday, October 22 <sup>nd</sup>	9A	Phase Diagrams, Eutectic Phase Diagrams
Friday, October 25 <sup>th</sup>	9B	The Iron-Carbon System
Tuesday, October 29 <sup>th</sup>	10A	TTT Diagrams
Friday, November 1 <sup>st</sup>	10B	Phase Transformations and Mechanical Properties
Tuesday, November 5 <sup>th</sup>	Chapters 9 and 10 Review	
Friday, November 8 <sup>th</sup>	11	Alloys
Tuesday, November 12 <sup>th</sup>	12/13	Ceramics
Friday, November 15 <sup>th</sup>	Chapter 11-13 Review	
Tuesday, November 19 <sup>th</sup>	14/15	Polymers
Friday, November 22 <sup>nd</sup>	16	Composites
Tuesday, November 26 <sup>th</sup>	18	Electrical Properties
Tuesday, December 3 <sup>rd</sup>	Chapters 14-18 Review	
Tuesday, December 10 <sup>th</sup>	Semester Review Quiz/Assignment	

### **COURSE OUTCOMES:**

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

- A. distinguish the different crystal structures of various materials and infer the material properties determined by them.
- B. classify crystal imperfections and discuss their influence on materials processes.
- C. use mechanical behavior data for a given material to predict a material's behavior under a certain load condition.
- D. interpret phase diagrams and predict material microstructures created by different heat treatments.
- E. identify the properties of the various classes of materials.
- F. assess the proper material to be used in certain applications.

### **COURSE OBJECTIVES:**

In the process of completing this course, students will:

- A. define the types of bonds and list their properties.
- B. classify the various crystal structures and use crystallographic techniques to describe their features.
- C. describe crystalline imperfections and analyze their influence on material behavior.
- D. analyze stress-strain curves and calculate materials' reactions to various stress conditions.
- E. differentiate elastic and plastic deformation.
- F. describe the mechanisms for strengthening materials.
- G. calculate failure loads of materials based on fracture and fatigue.
- H. calculate materials' reactions under high temperature loading.
- I. interpret phase diagrams and solve problems based upon them.
- J. use phase diagrams to predict microstructural development in materials under heat treatment.
- K. analyze the properties of the various classes of materials.
- L. categorize and investigate the variety of materials within each materials class.
- M. outline and apply the electrical, magnetic and corrosive properties of materials.