

**Engineering Materials**  
*Fall 2015*  
**Engineering 4**  
Section #58090



**Instructor:** Dr. John Heathcote  
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**Class Format:** ONLINE, with on-campus tests

**Office Hours:** Monday, 10 AM-10:50 AM, 12:00-12:50 PM  
Tuesday, 12-12:50 PM  
Wednesday, 10 AM-10:50 AM, 12:00-12:50 PM

**On-Duty in the RC Math Center (FEM-1):** Thursday, 12-1 PM  
Friday, 10-11 AM

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

**Prerequisites:** CHEM 1A, PHYS 4A

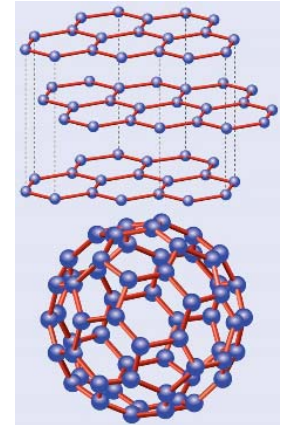
**Catalog Description:** This is an introductory course on the properties of engineering materials and their relation to the internal structure of materials. Topics include atomic structure and bonding; crystalline structures; phases and phase diagram; metals; polymers; ceramics; composites; mechanical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

**Optional Textbook:** Materials Science and Engineering, An Introduction, 9<sup>th</sup> Edition, William D. Callister, Jr., Wiley

*(You will be completing assignments on the online website. However, a textbook will still be very useful for reading the material and seeing the examples. I would recommend finding an older edition of this textbook. It will be much cheaper but will still cover the same material.)*

**Required Online Site:** Access to the WileyPLUS site linked to our Blackboard course site.

Online cost is around \$106 (which includes the full etext)



Options for your textbook and WileyPLUS access:

- One option for you is to purchase the textbook with the included access code. The textbook is sold with the access code at the Reedley College bookstore.
- Another option is to purchase the access code by itself online. The access code by itself is around \$106. The entire textbook is available through WileyPLUS. So, if you do not care for an actual textbook, you can just read it online. Or, if you have a used copy of the textbook, you could purchase the access code by itself online. **YOU MAY FIND THAT BUYING A USED COPY OF AN OLD EDITION MAY BE VERY HELPFUL TO YOU SO THAT YOU HAVE A HARDCOPY OF THE TEXT TO REFER TO.** (You can find very cheap copies of older editions online.)
- If necessary, you are able to obtain a 14-day grace period for using the site. You will be able to begin work in the course, but you will need to pay for your registration within the first two weeks.

<b>Grading:</b>	70%	Tests and Final Exam
	30%	Online Assignments

**Tests and Final Exam:** There will be four tests during the term. The first three tests will cover the chapters from that unit. The fourth test will cover the most recent unit, but will also include questions covering the cumulative content from the entire semester. Rules for what is allowed for each test will be announced before each test. Students will take these exams on the Reedley College campus. The dates for these exams are **9/17, 10/22, 11/19, and 12/17 at 7 pm in FEM-3.** Photo identification is required when you come in to take each test.

**Alternate Test Arrangements:** Students who are unable to take the tests at the times listed above will need to make special arrangements ahead of time with the instructor.

**Online Assignments:** Online assignments are designed to allow students to apply the concepts that they learn in the course. Most of these will be completed on WileyPLUS (linked to our Blackboard course site). Certain assignments may have special instructions which will be given at the time of the assignment.

**Homework Grading Policies:** Late assignments will only receive 70% credit. (This applies only to the problems that are submitted late, not to the entire assignment.) Assignments must be completed by the date of the test for that unit to receive any credit. Students will have unlimited attempts to get each question correct. It is important that you use these assignments to learn the material.

**Deadline Schedule:** A schedule of deadlines is posted on Blackboard and at the end of this syllabus. On most weeks, the deadlines fall on Tuesday and Friday (at 2:00 pm). On weeks when there is a test, the test will be given on a Thursday. On these weeks, there will be no other deadline on Tuesday of that week and the Friday deadline is shifted back to Sunday night at 11:59pm.

<b>Grading Scale:</b>	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.

<b>Add Date:</b>	Friday, September 4 <sup>th</sup>	Last day to add a course
<b>Drop Date:</b>	Friday, October 16 <sup>th</sup>	Last day to drop this course
<b>Holidays:</b>	Monday, September 7 <sup>th</sup>	Labor Day
	Wednesday, November 11 <sup>th</sup>	Veterans' Day
	Thursday-Friday, November 26 <sup>th</sup> and 27 <sup>th</sup>	Thanksgiving Holiday

**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.

**Course Outline:** (subject to change) -- Assignments are due by 2:00PM on the day shown (unless otherwise noted)

<b>Due Dates</b>	<b>Textbook Chapter</b>	<b>Topics</b>
Wednesday, August 19 <sup>th</sup>	1	Introduction
Friday, August 21 <sup>st</sup>	2	Atomic Bonding
Tuesday, August 25 <sup>th</sup>	3A	Crystal Structures
Friday, August 28 <sup>th</sup>	3B	Crystallography
Tuesday, September 1 <sup>st</sup>	4A	Imperfections
Friday, September 4 <sup>th</sup>	4B	Imperfections
Tuesday, September 8 <sup>th</sup>	5	Diffusion
Friday, September 11 <sup>th</sup>	Chapters 1-5 Review	
<b>Thursday, September 17<sup>th</sup> (7:00pm)</b>	<b>TEST #1</b>	<b>Chapters 1-5</b>
<b>Sunday, September 20<sup>th</sup> (11:59pm)</b>	6A	Stress and Strain
Tuesday, September 22 <sup>nd</sup>	6B	Elastic and Plastic Deformation
Friday, September 25 <sup>th</sup>	6C	Mechanical Properties
Tuesday, September 29 <sup>th</sup>	7A	Dislocations/Plastic Deformation
Friday, October 2 <sup>nd</sup>	7B	Strengthening Mechanisms
Tuesday, October 6 <sup>th</sup>	8A	Fracture
Friday, October 9 <sup>th</sup>	8B	Fatigue / Creep
Tuesday, October 13 <sup>th</sup>	Chapters 6-8 Review #1	
Friday, October 16 <sup>th</sup>	Chapters 6-8 Review #2	
<b>Thursday, October 22<sup>nd</sup> (7:00pm)</b>	<b>TEST #2</b>	<b>Chapters 6-8</b>
<b>Sunday, October 25<sup>th</sup> (11:59pm)</b>	9A	Phase Diagrams, Eutectic Phase Diagrams
Tuesday, October 27 <sup>th</sup>	9B	The Iron-Carbon System
Friday, October 30 <sup>th</sup>	10A	TTT Diagrams
Tuesday, November 3 <sup>rd</sup>	10B	Phase Transformations and Mechanical Properties
Friday, November 6 <sup>th</sup>	11	Alloys
Tuesday, November 10 <sup>th</sup>	12/13	Ceramics
Friday, November 13 <sup>th</sup>	Chapters 9-13 Review	
<b>Thursday, November 19<sup>th</sup> (7:00pm)</b>	<b>TEST #3</b>	<b>Chapters 9-13</b>
<b>Sunday, November 22<sup>nd</sup> (11:59pm)</b>	14/15	Polymers
Tuesday, November 24 <sup>th</sup>	16	Composites
Tuesday, December 1 <sup>st</sup>	17	Corrosion and Degradation of Materials
Friday, December 4 <sup>th</sup>	18	Electrical Properties
Tuesday, December 8 <sup>th</sup>	Chapters 14-18 Review	
Friday, December 11 <sup>th</sup>	Semester Review	
<b>Thursday, December 17<sup>th</sup> (7:00pm)</b>	<b>TEST #4</b>	<b>Chapters 14-18 + Cumulative</b>