



## Glendale Community College

### Engineering Department

#### Course Syllabus

Course Syllabus: ENGR 140, Materials Science and Engineering,

Fall 2024 3-Units

C-ID Descriptor ENGR 140 Materials Science and Engineering

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#### Instructor Contact Information

- **Professor Christopher Herwerth, M.S., P.E.**
    - MS Mechanical Engineering
    - BS Mechanical Engineering
    - CA Professional Engineer, License No. M 34433
  - **GCC Email: [cherwerth@glendale.edu](mailto:cherwerth@glendale.edu)**
  - **Course Meeting Time: Online**
  - **Online Office Hours: Monday, Wednesday, and Friday 10 AM – 11:45 AM**
    - I will be holding online Synchronous Office Hours every Monday, Wednesday, and Friday **starting Wednesday September 4, through Zoom**. This means, I will be online providing instant feedback during this time.
    - If students cannot make these hours and would like to talk another time, they may request an appointment to chat by sending me a message through CANVAS or email [cherwerth@glendale.edu](mailto:cherwerth@glendale.edu).
    - Students may also message me any questions and allow 24 hours for a response.
    - Inquiries sent on Fridays may not be returned until the following Monday.
    - There are also Q&A discussion forums where other students may help answer questions before I get there to do so.
    - Students are strongly advised to exchange contact information, as peer-to-peer discussion about technical content is frequently a highly successful learning activity.
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#### Course Description

Description: ENGR 140 examines the internal structures of materials and their subsequent behaviors used in engineering applications, including metals, ceramics, polymers, composites and semiconductors. Students learn how to select appropriate materials to meet engineering design criteria and to understand the effects of heat, mechanical stress, imperfections, and chemical environments on material properties and performance.

Prerequisites: CHEM 101 General Chemistry AND PHYSICS 101 Physics for Scientists and Engineers A or equivalent.

UC and CSU Transferable

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### About This Class

- This course is Online Asynchronous: We will not meet on-campus for any reason, but you must log into the class via Canvas during each week and complete course assignments. Attendance means that you have logged into Canvas and submitted assignments, quizzes and/or discussions each week.
- This 16-week, asynchronous course officially starts Tuesday September 3 and ends Wednesday December 18.
- Students must log into CANVAS during the first week of this Remote Synchronous class and complete two assignments: 1. the [Icebreaker discussion](#) (self-introduction) and 2. [the syllabus quiz, both before Sunday 11:59 pm, September 8.](#)
- Students who **do not** log in and complete both the introduction Check-in Discussion and Syllabus Quiz, will **be dropped from the course by the following Sunday 11:59 pm.**
- Syllabus Quiz: Click on the syllabus quiz **after** carefully reading the course syllabus and follow the steps to answer the questions of the quiz.
- For more information on course drops, See Refund/Payment Policy: <https://www.glendale.edu/home/showdocument?id=25858> (Links to an external site.) [REFUND/REPAYMENT POLICY A. Refund Policy for All Students - glendale.edu](#) (Links to an external site.)
- Below are a few resources for students about what it means to drop a class:
  - [It's okay to drop a class, really! \(Links to an external site.\) \(Links to an external site.\)](#)
  - [Should I Drop a Class? \(Links to an external site.\) \(Links to an external site.\)](#)
  - [To Drop or Not to Drop? \(Links to an external site.\)](#)

### Browser Compatibility:

It is highly recommended to use the most recent version of Chrome, Firefox, Edge or Safari as your browser to make sure everything works correctly in Canvas.

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## Student Learning Outcomes

At the conclusion of the course, students will be able to:

1. explain the relationship between internal structure of materials and their macroscopic physical properties
2. examine intentional and unintentional methods of altering the structure of materials by mechanical, chemical, or thermal methods in order to manipulate material properties:
3. characterize the various systems of classifying materials, and compare differences in properties among material classes that derive from differences in structure.
4. evaluate appropriate materials to meet engineering design criteria by gathering data from reference sources regarding the properties, processes, and performance characteristics of material.

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## Textbook(s) and Required Materials

William D. Callister, JR and David G. Rethwisch, Materials Science and Engineering any edition, Wiley.

ISBN-13: 9781119405498 10th edition

ISBN: 978-1-118-32457-8 9th edition

(Older editions are acceptable. Problems will be posted with the assignments)

## Additional Acceptable Textbooks

Introduction to Materials Science for Engineers, James Shackelford

Essentials of Materials Science and Engineering, Michael Ashby, Hugh Shercliff, and David Cebon

**Alternative Textbook Source** <https://www.redshelf.com/> (Links to an external site.)

- Please let me know right away if any materials are not accessible in this course and I will ensure access in a timely matter.

Note on Materials Science Textbooks. You may find that the 10th edition of the Callister book has limited availability. I will be using the 9th and 10th edition of the Callister book to create assignments and videos for Canvas. Students using other books should be successful since the material posted in Canvas will be self-contained; meaning you won't have to go to a specific book to learn about that topic. You can find that topic in the book you are using and I will give all information that you need to solve any particular problem. **I very much recommend obtaining a textbook and reading it extensively though!**

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## Course Communication

### Email

If you ever have any questions, please email me through Canvas by clicking on "Inbox" on the left side of your homepage. Click on "Compose a new message", select this course and then select "Teachers" under the "To" field and you will find my name, **Christopher Herwerth**. This is email inside Canvas :-). I am not supposed to receive any personal email...Canvas email only, please! **I will respond to your email within 24 hours, M-F**. If you do not hear back from me within this time, please assume I did not receive your email and resend it.

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## Course Assignments

### Important Dates

The due dates for your assignments can be found in the *Calendar* in the **global navigation links at the top of your screen**. Please review these. In addition, I will post reminders prior to the due dates in the *Announcements*.

### Weekly Assignments

Each week you will need to complete the following:

- Read/Watch the daily lessons. These will be available every **Friday**.
- Take the **quizzes**, available on **Fridays, by 11:59 pm by the specified due date, usually Mondays**.
- Complete the **assignments** in each course lesson by **Mondays 11:59 pm (10 days after homework is assigned)**
- **Homework Formatting: All assignments shall have a formal structure with Given, Find, Assumptions, Sketch, Free Body Diagram, Plan/Solution, and Unit Check with Boxed Answers and Discussion sections. See Canvas Page "Engineering Problem Solving Methods" for additional details. Assignments submitted without the formal structure will be docked 50% with no re-submission allowed.**

### Assignment Rubric

Engineering Problem Solving Rubric



Criteria	Ratings			Pts
<p><b>Problem Set-up</b></p> <p>Problem is clearly organized with Given, Find, Assumptions, Equations, Solution section with Unit Check or Alternate Solution. Includes all relevant information. A sketch and/or free-body diagram are drawn.</p>	<p><b>35 pts</b> <b>Full Marks</b></p> <p>The problem solution contains all necessary and significant structure and set-up information.</p>	<p><b>20 pts</b> <b>Partial Marks</b></p> <p>The solution contains some but not all necessary structure and information or may be missing a diagram or stated requirement.</p>	<p><b>0 pts</b> <b>No Marks</b></p> <p>The solution does not contain any structure of information for the set up of the problem.</p>	35 pts
<p><b>Calculation and Answers</b></p> <p>Problem solution contains step by step calculations that are neat and easily read. The answer is clearly circled or boxed and a unit check or alternate solution calculation is included.</p>	<p><b>35 pts</b> <b>Full Marks</b></p> <p>Full set of calculations are included with clearly marked answers with unit check or alternate solution of other check.</p>	<p><b>20 pts</b> <b>Partial Marks</b></p> <p>The solution is missing the unit check or alternate calculation or other checking method or the solution does not show sufficient calculation steps for understanding.</p>	<p><b>0 pts</b> <b>No Marks</b></p> <p>Little or no calculations are shown and no check of the answer is presented</p>	35 pts
<p><b>Discussion or description of the problem</b></p> <p>An explanation of the solution is included such as one or two sentences explaining what the answer means. Alternate solutions may be explained or the importance of the solution is included. Bulleted descriptions of the calculation steps are included in the calculation section in addition to the final discussion.</p>	<p><b>30 pts</b> <b>Full Marks</b></p> <p>There is a written explanation of the solution or other discussion of the importance or relevance of the calculations. One or two sentences is included and the explanation demonstrates understanding of the underlying concepts of the problem.</p>	<p><b>15 pts</b> <b>Partial Marks</b></p> <p>The discussion is limited or trivial. Explanation does not demonstrate a full understanding of the concepts.</p>	<p><b>0 pts</b> <b>No Marks</b></p> <p>No discussion or explanation is included at the end or throughout the problem solution.</p>	30 pts

Total Points: 100

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## Grading

Assignments	40%
Quizzes	30%
Final Exam	30%
Extra Credit	5%

A 90 - 100

B 80 - 89

C 70 - 79

D 60 - 69

\*Grading breakdowns are approximate. Your grade may be rounded up with professor's judgement of level of effort and understanding. *Doing your own work and asking questions are highly valuable. The Professor is here to help. Grading is based on the weights in the syllabus and may not align with Canvas. Use the Syllabus as your guide. Verbal discussions with the instructor do not supersede the syllabus.*

### Notes on Grading Items:

**Assignments:** There will be approximately 40 assignments given worth about 1 point each. Each assignment may include two or three problems to solve. Most of these will required an explanation written in your own handwriting that demonstrates that you understand the problem. All assignments are open resource and you are encouraged to form study groups to solve them. This will add up to about 80 to 100 problems solved over the course of the semester. May also include discussions. **(40%)**

**Quizzes:** There will be about 10 quizzes including the Check-in Syllabus Quiz. Quizzes will be fairly easy but they must be completed on time as there will not be any make-up quizzes. The Syllabus Quiz is due on Sunday September 5 by 11:59 PM and subsequent quizzes will be due by 11:59 of the first day of the week; usually Mondays. **(30%)**

**Final Exam:** The final exam will be a take home, open resource exam and like the assignments you will be required to use the formal engineering problem solving method and explanation in the discussion section will be heavily weighted. **(30%)**

**Extra Credit:** All students are encouraged to meet with the Instructor for teleconferences via Zoom. You may earn up to 5 points extra credit for simply meeting with the Instructor during office hours. Office visits can be technical in nature or you can ask questions on typical engineering advising topics. **(5% maximum, usually one point for each visit and discussion)**

## Course Grades & Feedback

You can view your grades using the *Grades* button in the **course navigation links**. Please check your grades regularly to make certain that I have received all your assignments. If you have a question about a grade, email me through the Canvas *Inbox* (left-side of your screen). Please do not post your personal concerns in a discussion forum.

I will be using the Canvas grading tool for your discussions and written assignments. You can see not only your grades, but also comments and feedback as well. Please always use the syllabus as the final guide for grading.

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## Submission Policy

Plan for success! Submit your work by the requested due date and time. If you have an extenuating circumstance, please contact me by private message **before** the assignment is due to make alternate arrangements.

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## Attendance/Participation/Refund Policies

- **Students who do not complete both the syllabus quiz AND the Check-in Discussion by Sunday September 8 will be dropped from the course per California State law for Distance Education.**
- **Participation = Attendance:** Attendance for this Online course is defined as logging into the course in Canvas and completing assignments, quizzes, and discussions. Participation for this class means completing and submitting work consistently each week. **Students who do not participate in this online class by submitting assignments, quizzes and/or discussions for a period of two weeks during the semester may be dropped from the course.**
  - Any student that is added as a 'late add' student has until Sunday Sept 15th 11:59 pm to complete the Check-In Assignment or be dropped.
- **Students:** Please refer to Student Rights in an Online and Hybrid Course (<https://www.glendale.edu/class-schedule/distance-education/de-faculty-center/student-rights-in-an-online-and-hybrid-course> (Links to an external site.)) if you have further questions regarding the expectations from your course and instructor.

## Additional Policies and Resources

### Academic Honesty

It is expected that all work submitted for grading is original, not copied from others and that the work being graded is indeed done by the student who is receiving the grade. Cheating and plagiarism are serious violations of the student conduct code. Cheating or plagiarizing will result in a zero on the assignment or test and may result in other disciplinary action taken by the College. All incidents of

cheating or plagiarizing are reported to the Dean of Students. For more information, please refer to the [Glendale Community College Academic \(Links to an external site.\)](#) Honesty Policy.

### **Late Work**

- **Late work will not generally be accepted for this class.**
- There are multiple assignments assigned per week. If accepted under special circumstances, late work will receive a 10% reduction *per day* late. For example, if your assignment is two calendar days late (e.g., due Feb 23rd 11:59 pm and student submits Feb 25th 3:15 pm, student can only earn a maximum of 80%.
- Students are advised to strategize with respect to time management for completing work. Generous due dates are built into this course. Submission of partially completed assignments are preferable to missing a submission deadline.

### **Students with Disabilities**

- All students with disabilities seeking accommodations are responsible for making arrangements in a timely manner through the [Center for Students with Disabilities \(Links to an external site.\)](#). Please let me know right away if you will need accommodations so we can pre-plan together.
- Please let me know if you have adaptive software and hardware to assist you with taking this course or if you have any specific needs of which I should be aware. You can find more information about Disabled Students Programs and Services (DSPS) or call the office at 818-240-1000 x5905.
- Students with disabilities have the right to receive reasonable academic adjustments in order to create an educational environment where they have equal access to instruction without fundamentally altering any course, educational program or degree. (GCC Board Policy, 2000)  
Any student who feels they may need an accommodation based on the impact of a disability should contact Disabled Students Program and Services (DSP&S) at (818) 240-1000 ext. 5905 or visit the DSP&S office in the San Rafael Building, 2nd Floor.

### **Non-discrimination and Equal Opportunity Policy:**

“Glendale Community College District is a multicultural community of people from diverse racial, ethnic, linguistic and class backgrounds, national origins, religious and political beliefs, physical and mental abilities, gender identities, and sexual orientations. The activities, programs, classes, workshops/lectures, and everyday interactions of this district are enriched by our acceptance of one another, and we strive to learn from each other in an atmosphere of positive engagement and mutual respect.” Please see the Glendale College Catalog, page 19.

### **Harassment Policy:**

“All forms of harassment are contrary to basic standards of conduct between individuals and are prohibited by state and federal law, as well as this policy, and will not be tolerated. The district is committed to providing an academic and work environment that respects the dignity of individuals and groups. The District shall be free of sexual harassment and all forms of sexual intimidation and



exploitation including acts of sexual violence. It shall also be free of other unlawful harassment, including that which is based on any of the following statuses: race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, genetic information, marital status, sex, gender, gender identity, gender expression, age, or sexual orientation of any person, or because he or she is perceived to have one or more of the forgoing characteristics.” Please refer to the Glendale College Catalog, page 19.

### **Student Technical Support**

Go to the [Student Tech Support \(Links to an external site.\)](#) page if you are having Canvas tech issues or check out the resources below:

- Canvas Questions ONLY: 24/7 Assistance at 1-844-600-4951
- Student Support through [Live Chat \(Links to an external site.\)](#)
- Student Support [On-Campus \(Links to an external site.\)](#)(SM 266)
- Student [Canvas Guides \(Links to an external site.\)](#)
- Student Distance Education [Success Tips \(Links to an external site.\)](#)

### **Student Online Services**

There are many additional services to help you during this course. A few of these include:

- [Free Online Tutoring \(Links to an external site.\)](#), which can be accessed through the website or through Canvas.
- [GCC Library \(Links to an external site.\)](#) (Databases & Online Chat), which can be accessed through the website or through Canvas.

Additional services can be found on the [GCC Student Services Webpage \(Links to an external site.\)](#).

### **Tentative Schedule (next page)**

## Tentative Schedule

ENGR 140 Materials Science and Engineering			
Fall 2024 Tentative Schedule			
Date	Subjects	Reading Assignments	Assignments (check Canvas for exact due dates)
Week 1	Chapters 1 and 2		Assignment 1 Chapter 1 Worksheet
3-Sep	Introduction, Definitions, History, Units; SI and US Customary, Environmental and Societal Issues	1.1 – 1.6	Assign 2 Chapter 2 Worksheet
Week 2	Chapter 2		Assign 3 Chapt 2 Problems 1, 5, 7, 18, 22, 23, 25
9-Sep	Holiday Sep 4, 2023	2.1 – 2.4	Assign 4 Unit Cell Worksheet
	Atomic Structure		Assign 5 Chapt 3 Problems 34, 35, 48
Week 3	Atomic Bonding in Solids	2.5 – 2.10	Assign 6 Chapt 3 Problems 58, 65
	Chapter 3		Assign 7 Chapt 4 Vacancies and Compositions
16-Sep	Crystalline Structure in Solids	3.1 – 3.7	Assign 8 Chapt 4 Problems 14, 15, 34
	Crystallographic Points, Directions, and Planes	3.8 – 3.17	Assign 9 Chapt 4 Problem 4.50 Grain Size Assign 10 Chapt 5 Problems 8, 9
Week 4	Chapters 4 and 5		Assign 11 Chapt 6 Problems 3, 8 Assign 12 Chapt 6 Problem 10
23-Sep	Imperfections in Solids, Grain Size	4.1 - 4.11	Assign 13 Chapt 6 Problems 19, 24
	Diffusion	5.1 – 5.7	Assign 14 Chapt 6 Problems 30, 39
Week 5	Chapter 6		Assign 15 Chapt 6 Problems 6.1 FE, 6.2 FE, 6.3 FE
30-Sep	Mechanical Properties of Metals	6.1 – 6.12	Assign 16 Chapt 7 Critical Resolved Shear Stress
			Assign 17 Chapt 7 Problem 12
Week 6	Chapter 7		Assign 18 Chapt 7 Problem 30
7-Oct	Dislocations and Strengthening Mechanisms	7.1 – 7.13	Assign 19 Chapt 7 Problem 40
	Grain Growth		Assign 20 Chapt 8 Stress Concentration
Week 7	Chapter 8		Assign 21 Chapt 8 Problem 7
14-Oct	Failure and Fracture Mechanics	8.1 – 8.12	Assign 22 Chapt 8 Problem 16
			Assign 23 Chapt 8 Problem 24
Week 8	Chapter 9		Assign 24 Chapt 9 Problems 10g, 17g,
21-Oct	Phase Diagrams	9.1 – 9.10	Assign 25 Chapt 9 Problem 19
	Development of Microstructure		Assign 26 Chapt 9 Mass Fraction problem Assign 27 Chapt 9 Problem 41
Week 9	Chapter 9		Assign 28 Chapt 9 Problem 43
28-Oct	Phase Diagrams	9.11 – 9.20	Assign 29 Chapt 9 Problem 67
			Assign 30 Chapt 12 Problem 3
Week 10	Chapter 12		Assign 31 Chapt 12 Problem 4
4-Nov	Ceramics	12.1 – 12.7	Assign 32 Chapt 12 Problem 43
			Assign 33 Chapt 12 Problem 44
Week 11	Chapter 14		Assign 34 Chapt 14 Problem 4
11-Nov	Polymers	14.1 – 14.8	Assign 35 Chapt 14 Problem 5
	Holiday Nov 11		Assign 36 Chapt 16 Problem 6
Week 12	Chapters 16		Assign 37 Chapt 16 Problem 9
18-Nov	Composites	16.1 – 16.11	Assign 38 Chapt 16 Problem 12
			Assign 39 Chapt 17 Problem 11
Week 13	Chapter 17		Assign 40 Chapt 17 Problem 28
25-Nov	Oxidation of materials	17.1 – 17.10	Assign 41 Chapt 17 Problem 30
	Holiday Nov 28 to 30		Assign 42 Chapt 18 Problems 1, 10
Week 14	Chapter 17		
2-Dec	Oxidation of Materials continued	17.1 - 17.10	
Week 15	Chapter 18		
9-Dec	Electrical and Thermal Properties	18.1 - 18.8	
	Final Exam Week Dec 11 - Dec 16		
Week 16			
16-Dec	Final Exam Due by December 17 11:59 PM		