

## 1 Course Number and Name

- a. **ENGR 3331:** Engineering Materials, Fall 2021
- b. Lesson: Section 010, Monday, and Wednesday 11:00 – 11:50 AM (@ VIN 238)
- c. Section 01Z, Monday 2.00 – 4.50 PM (@ HSEL 109)
- d. Section 02Z, Tuesday 2.00 – 4.50 PM (@ HSEL 109)
- e. Section 03Z, Wednesday 3.00 – 5.50 PM (@ HSEL 109)

## 2 Credits and Contact Hours

- a. **Credits:** 3
- b. **Contact Hours:** 2 hours/week (Classroom) 3 hours/week (Lab)

## 3 Instructor Information

- a. **Course Coordinator:** Mohammad Shafinul Haque, PhD
- b. **Instructor:** Mohammad Shafinul Haque, 325-486-5509, [mohammad.haque@angelo.edu](mailto:mohammad.haque@angelo.edu).  
Office: VIN 281. For office hours see [faculty homepage](#).

## 4 Required Course Materials

- a. **Required textbook:** *Materials Science and Engineering: An Introduction* by William D. Callister Jr.; David G. Rethwisch, Edition: 10th, Publisher: Wiley, 2018.  
ISBN-10: 1119405394, ISBN-13: 978-1-119-40549-8.
- b. It is recommended that you keep a binder to organize course materials, notes, HWs, Exams. You must bring a calculator, pen/pencil, and notebook to write down notes.

## 5 Technology Requirements

This requires internet access and the ability to use the following online tools: Blackboard, Gradescope, Blackboard Collaborate, Adobe Acrobat (or another pdf maker), YouTube. No specific hardware is required, but access to a computer with webcam is highly encouraged.

## 6 Specific Course Information

- a. **Catalog Description:** Introduction to engineering material chemistry, microstructure, failure, and processing. Evaluation of material performance under applied loads for engineering applications. Physical properties of metals, ceramics, polymers, and composites. (3 credit with 2 Lecture hours and 3 Lab hours per week)
- b. **Prerequisites:** CHEM 1411 General Chemistry and ENGR 2332 Mechanics of Materials.
- c. **Required or Elective Course:** Required

## 7 Specific Goals for the Course

- a. When you complete this class, you should be able to:
  1. Perform standard experiments commonly used in engineering and describe mechanical properties of different engineering materials (polymers, different metallic alloys, wood)
  2. Describe, analyze, and interpret experimental data, perform error analysis, develop stress-strain relationships, evaluate variability to determine statistical significance.
  3. Describe the interatomic bonding, chemical structures, and microstructure that affects the mechanical properties of different engineering materials
  4. Describe the crystal structure, imperfection, and defects in different engineering materials that are driving the dominant failure mechanism

5. Describe the mechanism of crack propagation for both ductile and brittle fracture modes; determine the fatigue and creep lifetime of engineering components
6. Describe the application and processing technique for different engineering materials
7. Communicate laboratory results in oral presentations and written reports

b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

**Table 1: Course Learning Outcomes mapped to ABET Student Outcomes**

<b>ABET Student Outcomes</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1. Solve Problems		X	X	X	X	X	
2. Design	X						
3. Communication							X
4. Ethics & Professionalism							
5. Teamwork	X	X					X
6. Experimentation	X	X					
7. Acquire New Knowledge		X					

## 8 Topics Covered

1. Structure of Materials
  - a. Atomic and Crystal structure
  - b. Interatomic bonding
  - c. Imperfections in solids
2. Mechanical Properties and Failure Analysis
  - a. Mechanical properties of metals
  - b. Failure, Corrosion, and Degradation
3. Phase diagram and Metal Processing
4. Ceramic, Polymer, & Composite

## 9 Course Delivery and Communications

### 9.1 Delivery Method

This is a face-to-face course with learning resources and supplemental materials posted in [Blackboard](#)<sup>1</sup>. Accommodations will be made for students who are in quarantine or isolation and are unable to attend.

### 9.2 Course Structure and Communications

This course has two significant components: Two one hours learning sessions and one three hours lab session per week. On-time attendance of sessions is REQUIRED. This is a face-to-face course with learning resources and supplemental materials posted in Blackboard.

For each learning session and lab, you are expected to have completed your assigned tasks, read the textbook chapter/lab-handout to be discussed on that day and come prepared to actively participate in class individually and as a team (through in-class exercises, discussions, and activities). You will be asked to provide feedback to your instructor before and during each lesson.

The instructor reserves the right to change the policies and procedures of this course when he deems it necessary. Any such changes will be implemented fairly and will typically not be a detriment to your grade. The instructor will notify you of any such changes in a timely manner.

The value of the course to you will be highly dependent upon your preparation for class. We will be using both Blackboard, and email to communicate during this course. In addition to your textbook, lesson materials will be delivered via Blackboard.

Faculty will respond to email within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

## 10 Professionalism

Professional engineering standards apply in this class. You are expected to demonstrate a behavior consistent with the conduct of **an individual practicing in the engineering profession**. You are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accept constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

## 11 Graded Material

### 11.1 Class Attendance, Participation, Timeliness and Teamwork

You are expected to meet every class meeting on time and prepared. Attendance will be taken. Should you find it necessary to miss a class for any reason, you are expected to notify your instructor as early as the absence is known—preferably before the absence.

Your online assignments will be due at the time specified on Blackboard. Assignments submitted in hard copy are due at the beginning of class on the due date. Your instructor may assess penalties for late work.

Nearly all worthwhile accomplishments from raising a family to launching the space shuttle are the work of teams. Engineering is no exception. All significant engineering projects are completed by teams. You will be assigned to a team for this course. The purpose of the teams are to give you practice working together and to provide a support group for you within the class. Outside of class, please collaborate and work with anyone you wish.

### 11.2 Quizzes

There will be quizzes and short questions on assigned reading materials are due before class.

### 11.3 HomeWorks

Problem sets will be due weekly and will be based on the previous week's lesson and lab topics. Check Blackboard for specific due dates. We will work on HWs in group but must upload to BB individually.

### 11.4 Lab Reports

The lab reports are due following week. The lab report should be prepared strictly following the report template. One lab report per group is required.

### 11.5 Exams

There will be four in-class exams. The first three in class exam will be 50 minutes and scheduled during class time. The fourth exam will be 120 minutes and scheduled per the university final exam calendar. All exams will be closed book. You will be provided an equation sheet, no notes are allowed. You must bring your own calculator.

### 11.6 Project

There will be a group project where student must design and fabricate a device for mechanical characterization of engineering materials.

### 11.7 Grades: Weighting and Letter Grades

The weighting system shown in Table 2 will be used in determining final grade for the course

**Table 2: Grade Weighting**

Item	Count	Pts Each	Total Pts	Percent
Quizzes	12	100	1200	5%
HomeWorks	08	100	800	10%
Exam I	1	100	100	12%
Exam II	1	100	100	16%
Exam III	1	100	100	16%
Exam IV	1	100	100	16%
Final Project	1	100	100	13%
Lab Reports	6	100	600	12%
Total			3100	100%

The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the [University Catalog](#):

A = excellent work, B = good work, C = average work, D = poor work, F = failing work

**Table 3: Grading Scale**

<b>Letter Grade</b>	<b>Number Grade</b>
A	≥ 90
B	[80 – 90)
C	[70 – 80)
D	[60 – 70)
F	< 60

### **11.8 Incomplete Grade Policy**

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)<sup>2</sup> for more information.

## **12 Classroom and University Policies and Student Support**

All students are required to follow the policies and procedures presented in the [Angelo State University Student Handbook](#)<sup>3</sup> and [Angelo State University Catalog](#)<sup>4</sup>.

### **12.1 Accommodations for Students with Disabilities**

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at [ADA@angelo.edu](mailto:ADA@angelo.edu). For more information about the application process and requirements, visit the [Student Disability Services website](#).<sup>5</sup> The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dr. Dallas Swafford  
Director of Student Disability Services  
Office of Student Affairs  
325-942-2047  
[dallas.swafford@angelo.edu](mailto:dallas.swafford@angelo.edu)  
Houston Harte University Center, Room 112

### **12.2 Title IX at Angelo State University**

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on

sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: [Incident Reporting Form](#)<sup>6</sup>

Face to Face: Mayer Administration Building, Room 210

Phone: 325-942-2022

Email: [michelle.miller@angelo.edu](mailto:michelle.miller@angelo.edu)

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit the [Title IX website](#).<sup>7</sup>

### **12.3 Student Absence for Observance of Religious Holy Days**

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for [Observance of Religious Holy Day](#)<sup>8</sup> for more information.

### **12.4 Information About COVID-19**

Please refer to ASU's [COVID-19 \(Coronavirus\) Updates](#)<sup>9</sup> web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

### **12.5 Student Conduct Policies**

#### **12.5.1 Academic Integrity**

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

#### **12.5.2 Plagiarism**

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)<sup>10</sup> in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin or SafeAssign. Resources to help you understand this policy better are available at the [ASU Writing Center](#)<sup>11</sup>.

### 12.5.3 Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

### 13 Course Outline

The lecture lesson outline is presented in Table 4. Detailed reading and homework assignments along with updates to this schedule will be provided via Bb. The schedules may be modified as the semester progresses.

**Table 4: Course Lesson Outline**

Week	Lesson	Date	Topic	Reading Textbook Chapter	Homework/Due
<b>Module 01 – (Ch. 2-4) Structure of Materials</b>					
01	01	Aug 23	Syllabus & Introduction	Ch 1.2-1.6	
	02	Aug 25	Atomic Structure	Ch 2.2-2.4	
	CS 01	23/24/25	CS Intro, Group formation, Project		<b>Project Introduction</b>
02	03	Aug 30	Atomic Bonding in Solids	Ch 2.5-2.6	
	04	Sep 01	Atomic Bonding in Solids	Ch 2.7-2.8	
	CS 02	30/31/01	CS1- Material Identification and Happy Noble Gas	(Problem Description)	<b>Project Selection</b>
03	05	Sep 06	NO CLASS	HOLIDAY	
	06	Sep 08	Crystal Structure	Ch 3.2-3.7	HW 01
	CS 03	7/8	CS1- Material Identification and Happy Noble Gas	(Data collection via Experiment)	
04	07	Sep 13	Imperfections	Ch 4.2-4.6	
	08	Sep 15	Microscopic Examination	CH 4.9-4.11	Submit Case Study report 01
	CS 04	13/14/15	CS2- Hardness of Materials	(Problem Description)	
	09	Sep 20	<b>EXAM 1- Module 01</b>		HW 02
<b>Module 02 – (Ch. 6,8,17) Mech. Properties &amp; Failure Analysis</b>					
05	10	Sep 22	Elastic and Plastic Deformation	Ch 6.1-6.6	
	CS 05	20/21/22	CS2- Hardness of Materials	(Data collection via Experiment)	<b>Draft Project Design proposal</b>
06	11	Sep 27	Elastic and Plastic Deformation	Ch 6.7-6.12	

	12	Sep 29	Fracture	Ch 8.2-8.6 (Problem Description)	Submit Case Study report 02
	CS 06	27/28/29	CS3 – Tension test		
07	13	Oct 04	Fatigue and Creep	Ch 8.7-8.15	HW 03
	14	Oct 06	Corrosion of Metals	Ch 17.1-17.7	
	CS 07	04/05/06	CS3 – Tension Test	(Data collection via Experiment)	
08	15	Oct 11	Corrosion of non-Metals	Ch 17.8-17.13	
	16	Oct 13	Review	Module 02	
	CS 08	11/12/13	CS4 – Energy Absorbed at Fracture	(Problem Description)	Submit Case Study report 03
	17	Oct 18	<b>Exam 2 –Module 02</b>	<b>(Part 1 &amp; 2)</b>	HW 04
	<b>Module 03 – (Ch 9, 11) Phase Diagram &amp; Metal Processing</b>				
09	18	Oct 20	Phase Diagram (PD)	9.1-9.6	
	CS 09	18/19/20	CS4 – Energy Absorbed at Fracture	(Data collection via Experiment)	<b>Finalize Project Design</b>
10	19	Oct 25	Binary PD	9.7-9.10	
	20	Oct 27	Binary PD	9.11-9.12	
	CS 10	25/26/27	CS5 – Heat Treatment	(Problem Description)	Submit Case Study report 04
11	21	Nov 01	Iron-Carbide System	9.17-9.19	HW 05
	22	Nov 03	Types of Metal Alloy	Ch 11.2-11.3	
	CS 11	01/02/03	CS5 – Heat Treatment	(Data collection via Experiment)	
12	23	Nov 08	Fabrication of Metals	Ch 11.4-11.7	
	24	Nov 10	Thermal Processing	Ch 11.8-11.9	
	CS 12	08/09/10	CS6 – Metallographic Preparation	(Problem Description)	Submit Case Study report 05
	25	Nov 15	<b>Exam 3 –Module 03</b>	<b>(Part 1 &amp; 2)</b>	HW 06
	<b>Module 04 – (Ch 13,15,16) Ceramic, Polymer, &amp; Composite</b>				
13	26	Nov 17	Ceramic Processing	Ch 13.11-13.15	
	CS 13	15/16/17	CS6 – Metallographic Preparation	(Data collection via Experiment)	
14	27	Nov 22	Polymer Processing	Ch 15.21-15.26	
	28	Nov 24	NO CLASS		



	CS 14	22/23	<b>Project Prototype Performance</b>		Submit Case Study report 05
	29	Nov 29	Composites	Ch 16.1-16.5	HW 07
15	30	Dec 01	Composites Processing	Ch 16.13-16.15	
	CS 15	29/30/01	<b>Project Oral Presentation</b>		
	31	Dec 06	Review		HW 08
16	32	Dec 08	Review		
	CS 16	06/07/08			
<b>Exam IV</b>					

CS = Case Study, Ch = Chapter.

\*Schedule subject to change. Any changes will be announced on Blackboard and via email.

### End Notes

<sup>1</sup> [angelo.blackboard.com](http://angelo.blackboard.com)

<sup>2</sup> <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>

<sup>3</sup> <http://www.angelo.edu/student-handbook/>

<sup>4</sup> <https://www.angelo.edu/academics/catalog/>

<sup>5</sup> <https://www.angelo.edu/current-students/disability-services/>

<sup>6</sup> <https://www.angelo.edu/incident-form>

<sup>7</sup> <https://www.angelo.edu/title-ix>

<sup>8</sup> <http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>

<sup>9</sup> <https://www.angelo.edu/covid-19/>

<sup>10</sup> <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>

<sup>11</sup> [http://www.angelo.edu/dept/writing\\_center/academic\\_honesty.php](http://www.angelo.edu/dept/writing_center/academic_honesty.php)