ENGR 003: Materials Science and Engineering (*4.0 Units*)

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Office Hours: M/W/F: 10:00 – 11am
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Welcome

Welcome to Engineering 003: Materials Science and Engineering. In this course we will learn how to utilize the molecular and chemical properties to understand how materials work under any conditions. Typical skills developed in this course will be the ability to use material properties to make design choices, understand hardness, material phase diagrams, and tensile tests. **SYLLABUS IS SUBJECT TO CHANGE, UPDATES WILL BE POSTED ON CANVAS.**

How to Succeed

Engineering is rarely ever an individual endeavor. It is commonly said that the main tenant of Engineering is **CLEAR COMMUNICATION**. For this class, I encourage you to contact me with any concerns, related with school or not. If it is something I cannot immediately help you with, I can point you to resources that will help. This includes but is not limited to food, housing, mental health or accessibility concerns, and others.

Engineering is a very demanding discipline and these courses are no exception. I will be asking a lot out of you, both through assignments and lab reports. The typical amount of time spent **outside** of class is approximately 12 hours (3 hours/unit x 4 units). This is the average – sometimes you will spend a lot more, sometimes you will spend a lot less.

Course Description

ENGR003: This course presents the internal structures and resulting behaviors of materials used in engineering applications, including metals, ceramics, polymers, composites, and semiconductors. The emphasis is upon developing the ability both to select appropriate materials to meet engineering design criteria and to understand the effects of heat, stress, imperfections, and chemical environments upon material properties and performance. Laboratories provide opportunities to directly observe the structures and behaviors discussed in the course, to operate testing equipment, to analyze experimental data, and to prepare reports.

Text:

Required: Materials Science and Engineering ZyBooks
Optional: Materials Science and Engineering: An Introduction by William D. Callister, Jr. (Class set provided).

SLO's:

- Determine Rockwell Hardness: Given a metal specimen, students will be able to correctly determine the Rockwell hardness of the specimen by choosing the appropriate indenter, minor load and major load for the selected Rockwell scale.
- Determining Phases: Given a binary phase diagram, students will be able to determine the phases present, the phase compositions, and the fractional amount of each phase present for a given temperature and alloy composition.
- Tensile Strength: Given load and elongation data from a tensile test, students will be able to calculate stress, strain, modulus of elasticity, tensile strength, modulus of resilience and modulus of toughness.

Homework:

Homework will be assigned at a bi-weekly interval along will ZyBooks reading. ZyBooks is an online textbook with interactive problems within the text that will help strengthen the connection with the material. These will be checked on every other week as well as a physical problem set due on Canvas.

Exams: In this class, you will be required to make design choices required to solve certain problems. The first half of this course will be focused on the fundamentals, and there will be two in-class examinations where we will test on the basic properties of materials. The second half of the course will consist of primarily take-home examinations where you will be given design questions, and you will articulate your point through scientific writing and analysis.

Project During Week 10 I will announce the projects for the course. This can be any type of material you want to analyze or choose one of the selected chapters in the ZyBooks textbook to write a summary report on. The last week of classes will consist of student presentations on their topic or material of choice. A sheet will be provided in class on Week 10 with the requirements.

Labs This is a lab course, which means every week we will be meeting for three hours to either expand on the topics in class through hands-on experimentation or discuss course topics further in a seminar-like style. For the in-class examinations, they will take place during the lab section.

In Class Worksheets: This course is going to build the material from the ground up. This means that the course will be constantly utilizing knowledge from previous topics. In order to stay on top of things, we will spend 30 minutes each Friday with an in-class worksheet you will complete with your table.

Evaluation:

Homework	10%	**Scale:**	90-100%	A
Labs	20%		80-89%	B
Exams	25%		70-79%	C
Final Exam	20%		60-69%	D
Project	15%		Below 59%	F
Quizzes	10%			

Attendance: As stated before, Engineering is a team sport. Your table will be working together on many things and if you are consistently absent your table may suffer losing out on your insights and work. If attendance is an issue, please contact me to discuss further.

Conduct: Please refer to the Catalogue or Student Handbook for Code of Student Conduct. Cheating is a violation of the Code of Student Conduct and will not be tolerated in class; to do so may result in a grade of "F". It can lead to permanent expulsion from this college. Cheating includes allowing someone to copy from your work.
**You may not use a Calculator that has a Qwerty keypad on the exams.

Tentative Class Schedule

Week	Topic
Week 1	Lecture: Chapter 1 Lab: Introduction to Scientific Report Writing, Engineering Statistics
Week 2	Lecture: Chapter 2 Lab: Spark Test
Week 3	Lecture: Chapter 3 Lab: Crystallography Calculations
Week 4	Lecture: Chapter 3 Continued Lab: Diffraction Lab

Week 5	Lecture: Chapter 4 Lab: Interstitials, Grain Size Lab
Week 6	Lecture: Chapter 4 Lab: Chapter 1-4 Exam
Week 7 [Everything Under This Section Subject to Change]	Lecture: Chapter 5 Lab:
Week 8	Lecture: Chapter 5 Lab:
Week 9	Lecture: Chapter 6 Lab: Rockwell Hardness Lab
Week 10	Lecture: Chapter 6 Lab: Chapter 5-6 Exam
Week 11	Spring Break
Week 12	Lecture: Chapter 7 Lab:
Week 13	Lecture: Chapter 7, Chapter 6-7 Exam Assigned Lab:
Week 14	Lecture: Chapter 8, Exam Due Lab:
Week 15	Lecture: Chapter 8, Chapter 8 Exam Lab:
Week 16	Lecture: Chapter 9, Exam Due Lab:
Week 17	Lecture: Chapter 9, Exam Assigned Lab:
Week 18	Project Presentations, Exam Due Friday
Final	TBD