

ENME 382: Engineering Materials & Manufacturing Processes

Spring 2021

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Class Meetings : TuTh 1230-220 PM at CSC 126

Office Hours : Monday 215-3 pm; Tuesday 915-11am; Wednesday 215-3 pm; Thursday 915-11am

Description: Structure of materials, phase transformations, corrosion and mechanical properties of metals, ceramics, polymers and related materials. Sustainability-informed materials selection and manufacturing processes for engineering applications.

Prerequisite: ENME 220

Textbook: It is recommended that you get the Integrated Approach textbook. Both books are available at bookstore, similar in chapter organizations. If you have the other book already, you do not need to purchase the Integrated Approach textbook.

Callister, William D., Jr., Rethwisch, D.G., “Fundamentals of Materials Science and Engineering: An Integrated Approach”, 4th Ed., John Wiley and Sons, 2012. ISBN # 978-1-1180-6160-2.

Or

Callister, William D., Jr., Rethwisch, D.G., “Materials Science and Engineering: An Introduction”, 9th Ed., John Wiley & Sons. ISBN# 978-1118324578

Course Objectives: The main objective of this course is to understand the process-structure-property relationships in engineering materials and use this information in materials selection for engineering design and processing. A student completing this course satisfactorily should be able to:

1. Identify features of crystal structures and their relationship to physical, mechanical, thermal, and chemical properties of materials.
2. Understand the similarities and differences in the microstructure of various engineering materials ranging from metals, ceramics, to polymers, biomaterials and beyond; and how these relate to their critical properties.
3. Interpret features of binary phase diagrams and identify phase transformations
4. Become familiar with common manufacturing processes for metals, ceramics, and polymers; their effects on structure; and their impact on sustainability.
5. Identify process-structure-property relationships in engineering materials; and understand how these apply to materials selection in specific engineering problems. Consider sustainability in materials selection.
6. Address basic concepts of engineering ethics.

Learning Outcomes

The objectives listed above support the following student outcomes stated in ABET Criteria:

- an understanding of professional and ethical responsibility
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Topics Covered:

I. Overview and Engineering Ethics

II. Atomic Structure and Interatomic bonding

III. Structure of Crystalline Solids (metals and ceramics)

IV. Defects and imperfections in solids (metals and ceramics)

V. Diffusion (metals and ceramics)

VI. Mechanical Properties

VII. Deformation and Strengthening Mechanisms

VIII. Phase Diagrams and Phase Transformations

IX. Remaining Deformation (Viscoelasticity) and Strengthening Mechanisms

X. Failure

GRADING POLICY:

A final grade will be assigned based on the following percentages:

Homework and quizzes: 20%

Mid-term project report and presentation 20%

Mid-term exam: 15%

Final project report and presentation 20%

Final exam: 15%

Attendance 10%

A: 90 and above B: 80-89 C: 70-79 D: 60-70 F: 59 and below

The final score will also be based on the student's overall performance.

COURSE PROJECT:

The students will be directed and to identify specific project problems, finish the report and present in the lectures of this course. The instructor will give students latest publications and suggestions about engineering materials. The students are expected to read, understand, summarize and share with his/her teammates by giving 30-45 minutes in class presentation.

Pop-Quizzes

Pop-Quizzes will be given at the beginning of class. **There will be no make-up quizzes.** A zero grade will be given to the missing quizzes. The intension of quizzes is to evaluate in class understanding and reinforce the attendance.

Any form of cheating and/or plagiarism, computer misuse and dishonesty, obstruction of rights of others and disruptive behavior will be treated according to the University Standards of Personal and Group Conduct.

The University will not tolerate disorderly or disruptive conduct which substantially threatens, harms, or interferes with University personnel or orderly University processes and functions. A faculty member may require a student to leave the classroom when his/her behavior disrupts the learning environment of the class. A student found responsible for disruptive behavior in the classroom may be administratively withdrawn from the course.

REPORTING OF CHILD ABUSE

Please be aware that according to state law in Maryland, educators are required to report current and past child abuse and neglect even when the former victim is now an adult and even when the former alleged abuser is deceased. If you disclose current or past abuse/neglect in class, in papers, or to me personally, I am required by law to report it. Please see me if you are interested in more information about this law.

FSU COVID-19 Policy

Your health and safety are important. Therefore, during every physical in-person meeting of this course, everyone is required to follow state, local, and University public health mandates as outlined in the FSU Social Compact. Everyone must wear a face mask that covers their nose and mouth, respect posted signage, and practice good social distancing by remaining at least 6 feet away from others. The Code of Student Conduct notes that following these health and safety protocols constitute complying “with a reasonable request from authorized University personnel in the performance of their official duties,” and failing to do so is a Code of Student Conduct violation. Students who do not comply with these mandates will be asked to leave class. Students who refuse to leave will be referred to the Dean of Students and may be administratively removed from the class if found to be responsible for Code of Conduct violations.