

EMA 3010 Materials

Class #: 13856

Section: 2999

Course periods: MWF Second Period; *Location:* Little 101

Academic term: Fall 2019

Instructors:

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313 Materials Engineering

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Monday: 4pm-6pm

Tuesday: 4pm-6pm

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Thursday: 12pm-1:55pm

4pm-6pm

Friday: 4pm-6pm

Office hours:

Monday: 10am-12pm

Course Description

This course provides a conceptual perspective for origin of materials behavior, including structure, property, performance interrelationships and materials processing. Various types of engineering materials are discussed, including metals, ceramics, and polymers.

Course Pre-Requisites

CHM 2045

Course Objectives

Students completing this course should be able to understand the fundamental concepts of materials science and engineering, describe the structure, processing, properties, and applications of metallic, ceramic, and polymeric materials, and understand structure-property-performance interrelationships.

Relation to Program Outcomes (ABET):

| Outcome | Coverage |
|--|----------|
| 1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics. | High |
| 2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. | |
| 3. An ability to communicate effectively with a range of audiences. | |
| 4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. | |
| 5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. | |
| 6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. | |
| 7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies. | |

Required Textbooks and Software

Textbook

Fundamentals of Materials Science and Engineering: An Integrated Approach, 5th Edition (**with Wiley Plus Access**) Note that the Wiley Plus software provides a full copy of the text online).

Author: William D. Callister, Jr. and David G. Rethwisch

Publisher: Wiley, ISBN: 9781119035640

It is required that you purchase Wiley Plus access to this textbook. It is required because we will use Wiley Plus for the homework as well as to access the textbook. You will need to purchase and set up Wiley Plus; instructions can be found here:

[Setting up your Wiley Plus access](#)

Materials Science Students: You will also use this book in EMA 3011 in the Spring, so you should pay to have access for more than just this semester.

Course Schedule

For us to stay on schedule with the other sections, several days of class will be canceled to make up for holidays or other conflicts that fall on days we don't have class.

| Week | Date | Chapter | Topic |
|------|-------------|---------|---|
| 1 | 8/21 | 1 | Introduction |
| | 8/23 | 2 | Atomic structure Atomic bonding |
| 2 | 8/26 | 3 | Structure of metals |
| | 8/28, 30 | | Structure of ceramics Miller's indices |
| 3 | 9/2 | 3 | No class (due to 9/2 holiday) |
| | 9/4, 6 | 4 | Miller's indices Crystalline and non-crystalline materials |
| 4 | 9/9, 11 | 4 | Polymer molecules |
| | 9/13 | 5 | Molecule structure and properties Polymer structure |
| 5 | 9/16, | 5 | Point defects |
| | 9/18 | | Line and planar defects Microscopy |
| 6 | 9/23, 25 | 5 | Diffusion |
| | 9/27 | 6 | No lecture (career showcase) Fick's laws |
| 7 | 10/1 | 6 | Exam 1 (Ch 2 - 5) |
| | 10/2 | | Factors that influence diffusion No class (due to 10/4 homecoming) |
| 8 | 10/7 | 7 | Stress and strain |
| | 10/9, 11 | | Elasticity Plasticity |
| 9 | 10/14 | 7 | Deformation of ceramics and polymers |
| | 10/16, 18 | 8 | Deformation mechanisms Strengthening mechanisms |
| 10 | 10/21 | 9 | Types of fracture |
| | 10/23, 25 | | Fracture mechanics Fatigue and creep failure |
| 11 | 10/28 | 10 | Phase diagrams |
| | 10/30, 11/1 | | Introduction to phase diagrams Binary-eutectic phase diagrams |
| 12 | 11/5 | 10 | Exam 2 (Ch 6 - 9) |
| | 11/6, 11/8 | | Ceramics and steel phase diagrams Phase diagram review |

| | | | |
|----|-----------------------|----|--|
| 13 | 11/11 11/13, 15 | 11 | No class on Nov 11 (Holiday) Phase nucleation Transformation kinetics Alloy properties |
| 14 | 11/18 11/20, 22 | 14 | Fabrication of metals Processing of metals Fabrication of ceramics |
| 15 | 11/25 11/27,29 | 14 | Synthesis and fabrication of polymers THANKSGIVING |
| 16 | 12/3 12/4 | | Exam 3 (Ch 10, 11, 14) Class discussion |

Course Policies

Attendance Policy

Each class period will be used for course lectures and the working of example problems. Attendance will be a critical aspect of learning the material, as the lectures will not be recorded. However, attendance will not be taken. There will be a 2% bonus added to your final grade if you attend class, at the discretion of the instructor.

Class Demeanor

Students are expected to arrive to class on time and be respectful to the instructor and to fellow students. Please avoid the use of cell phones and conversations that do not contribute to the discussion should be held at minimum.

Course Communication

E-Learning will be the primary avenue for communication and course management. All announcements for the course will be made using the announcement system on the E-Learning site. Discussion groups will be made for each module. All questions regarding the module and the homework assignment should be made using the discussion group. Course notes will be posted on E-Learning before each lecture.

Make sure and change your E-Learning settings so that you get notifications about announcements, assignment changes, etc. in a timely manner.

Homework

Homework problems for each module will be assigned, submitted, and graded using Wiley Plus through the E-Learning web site. Two attempts are allowed for each question. Homework can be turned in up to three days late with a 10% reduction in your grade per day.

Working with other students on the homework assignments is allowed, though each student must complete their own assignment and submit it using Wiley Plus.

Homework will count as 20% of your total grade.

Quizzes

Quizzes will be given through E-Learning, one in each module. You will have 15 minutes to take each quiz, and they will be open book, open note, and open internet. However, do not work with other students on the quizzes. The quizzes will open the day after the homework is due and you will have 36 hours to complete them. This schedule may have to be adjusted slightly for quizzes that are right before the exam.

The two lowest quiz grades will be dropped.

Quizzes will count as 5% of your total grade.

Exams

You will be given three exams throughout the semester; the exam content may change but the dates will not. The exams will be given in the evening. **There will be no final exam.** Each exam is weighted equally and will be worth 25% of your final grade.

Make-up exams will be provided only with the prior approval of the instructor or excused absence. In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, religious holidays and participation in official university activities such as music performances, athletic competition or debate.

Calculators: You may use either a graphing (Ti84, Ti89, etc.) or a scientific calculator on the exams. If you are unsure about your calculator, it is your responsibility to check with the instructor for approval. Calculators will not be provided if you forget or bring the wrong calculator.

Grade Appeal

Your homework will be graded automatically by Wiley Plus. Any questions or concerns on the homework grading should be emailed to Chieh-Ming Tsai (cmtsai@ufl.edu). For questions on exams, contact Dr. Batich or Dr. Saleem. After two weeks have passed since the due date, no grades will be changed.

Grading Scheme

| | | | | | | | | | | | | |
|-------|----|----|----|----|----|----|----|----|----|----|----|-----|
| Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |
| Score | 93 | 90 | 87 | 83 | 80 | 77 | 73 | 70 | 67 | 63 | 60 | >60 |

Note that the score listed on the table is the lower bound for that grade.

Extra Credit

Each exam will have extra credit questions allowing students to earn greater than 100%.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the [Disability Resource Center](#) (352-392-8565) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Approximately half way through the course, a mid-term evaluation will be given to the students. The comments and suggestions provided during the mid-term evaluation will be carefully considered by Dr. Batich and/or Dr. Saleem and appropriate changes will be made to the course to address the comments, if possible.

Students are also expected to provide feedback on the quality of instruction at the completion of the course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.”

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

[The Honor Code](#) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TA in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center:

<http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS):

Student Health Care Center, 392-1161.

University Police Department:

392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support

352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center

Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support

<http://cms.uflib.ufl.edu/ask>. There are various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center

Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio

302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf