

EMA 3010 – Introduction to Materials Science and Engineering

Course Syllabus – Spring 2019 Section 23B4

| | Office | E-Mail |
|----------------------|-----------------------------|--|
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Course Description (3 credit hours)

Conceptual perspective for origin of materials behavior and the interrelationships of structure, property and performance. Materials selection and use of familiar materials- metals, ceramics, polymers, electronic materials and composites in electronic, structural and other engineering applications.

Course Objectives

This is an introductory course, designed to provide the fundamental concepts of Materials Science and Engineering. Students will be able to describe structure, properties, and applications of metallic, ceramic, polymeric and composite materials and the significance of the electronic, thermal, magnetic and photonic properties in applications.

Class Time

Monday, Wednesday, Friday Period 6 12:50-1:40 pm MCCC 100

Prerequisites: CHM 2045

Text book: (required)

Title: Materials Science and Engineering: An Introduction, 10th Edition
Author: William D. Callister and David G. Rethwisch
ISBN: 9781119405498, 10th edition, e-book

Course Website

The course website is on the Canvas system <http://elearning.ufl.edu/>, where you can find the syllabus, lecture notes, homework problems, announcements, and your grades. Please check it frequently.

Lectures

Lectures are critical to success in this MSE course. Attendance is not required but highly encouraged since there will be In Class Exercises (ICE). Students are encouraged to ask questions and participate. The fundamental concepts will be repeated as required based on the ICE discussions and exam results as needed.

Homework, due as shown in WileyPlus Assignments

Homework exercises from the end of each chapter will be assigned. These homework questions are essential to your study and some exam questions will be adapted from them. There will be 12 homework assignments throughout the semester, and the lowest 2 will be dropped from the final score. Each homework assignment is weighted equally, and the homework will account for **10%** of your grade. Homework will be multiple-choice and will be posted, submitted, and graded through the Canvas/WileyPLUS web site via e-learning. **No late homework assignments will be accepted.** You will be allowed 1 or more re-submission attempts for each homework, but this must be done before the homework due date/time, so start your homework assignments early to allow time for resubmission. Please see the TAs during office hours to discuss homework problems.

Exams

There will be 4 Midterm exams throughout the semester. The exam content may change and the dates are tentative and will be finalized after the add/drop period. Each exam is weighted equally, and each exam will be worth 30% of your final grade. The lowest exam score will be dropped. Review sessions will be given prior to each exam. The tentative exam dates are as follows;

| | |
|----------------|-----------------------------|
| Midterm Exam 1 | : Friday, February 1, 2019 |
| Midterm Exam 2 | : Friday, March 1, 2019 |
| Midterm Exam 3 | : Friday, March 29, 2019 |
| Midterm Exam 4 | : Wednesday, April 24, 2019 |

You have two weeks after the test results are posted to resolve any questions about scores and grades. No changes to your exam grade will be made after that time.

Exam Conflicts with other course exams

The official UF policy on exam conflict resolution states that when two exams conflict, the course with the higher number will take priority. There will be no exceptions to this rule.

Make-up exams

Students not presenting an exam will receive a grade of 0. There will be no make-up for a missed exam. Instead, the lowest exam score will be dropped. In all cases, excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation. Additional information can be found here:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Grading

Grades will be based on your understanding and mastery of the material as demonstrated by quantitative scores on homework (10%), the top three exam scores (30% each).

Grading Scale

| | | | | | | | | | | | | |
|--------------|-----|------|------|-----|------|------|-----|------|------|-----|------|-----|
| Percentage | ≥92 | ≥88 | ≥84 | ≥80 | ≥76 | ≥72 | ≥68 | ≥65 | ≥62 | ≥59 | ≥56 | <56 |
| Letter Grade | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | E |
| Grade Points | 4.0 | 3.67 | 3.33 | 3.0 | 2.67 | 2.33 | 2.0 | 1.67 | 1.33 | 1.0 | 0.67 | 0 |

A “C-“ will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Office Hours

Office hours : Monday 3:00 pm - 4:00 p.m. [PS&T 205C]
(you can also ask questions after the classes as necessary)

TA office hours : TBD

I will always try to respond to e-mail questions as fast as possible. Important e-mail questions (minus identifying information) and answers will be posted to the class either by e-mail or on the course website for the benefit of other students.

Contribution of course to meeting the professional component

This course provides 3 credits towards engineering sciences.

Relation to program outcomes

| Outcome | Coverage* |
|---|-----------|
| a. Ability to apply knowledge of mathematics, science, and engineering to materials systems. Demonstrated through homework problems and exams. | High |
| b1 Ability to conduct experiments, analyze and interpret data. | |
| b2 Ability to conduct and analyze design of experiments (DOE). | |
| c Ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints. | |
| d Ability to function on multi-disciplinary teams. Demonstrated through in-class exercises and course projects. | Low |
| e Ability to identify, formulate, and solve engineering problems. Demonstrated through homework problems and exams. | High |
| f Understanding of professional and ethical responsibility. | |
| g Ability to communicate effectively in both oral and written form. Demonstrated through in-class participation and project presentations. | Low |
| h1 Understanding of the economic impact of engineering solutions. | |
| h2 Understanding of the global, societal, and environmental impact of engineering solutions. | |
| i Ability to engage in lifelong learning. Demonstrated through assigned homework on material not covered in class or textbook. | Medium |
| j Knowledge of contemporary issues. Demonstrated through homework on recent materials related news. | Medium |
| k Ability to use the techniques, skills, and tools needed for practice as a materials engineer. Demonstrated through in-class exercises, homework problems, and exams. | High |

* Coverage is given as high, medium, or low. An empty box indicates that this outcome is not a part of the course.

- Bonus points - There may be some bonus point activities that will be assigned during the class hours.

- In Class Exercises (ICE) - There will be multiple “in class” exercises during the class hours. Students will be allowed to work in small groups or work individually depending on the type of given assignment. ICE may be assigned as bonus points as an indicator of class participation.
- Midterm Exams –
 - All cell phones must be turned off and they cannot be used in place of a calculator.
 - 1 letter size paper can be used as a cheat sheet for the exams that only contains the formula relevant to the chapters included in the exam.
 - You are responsible to know all the functions of your calculators
 - Show all your work as needed
 - Any suspicious activity during exam will result in marking of your exam paper to be evaluated accordingly.
- Behaviour in class –
 - No behavior that can distract the other students in class will be allowed.
 - Jean-Jacques Rousseau Principle “Ones freedom ends where the others freedom starts.”
 - Destructive behavior will result in your dismissal from the class.
- Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.
See <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>
- Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
- UF Counseling Services –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
Career Resource Center, Reitz Union, 392-1601, career and job search services.
- Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

- Software Use – All faculty, staff and student 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.
- Record keeping - all materials from this class that students did not pick up (graded exams, etc.) within 1 year of the end of class will be shredded on or after June 30, 2019.
- Syllabus Changes – *I reserve the right to make changes in the syllabus as needed. Any changes will be clearly announced on canvas and in class.*

Tentative Course and Lecture Outline

| Week | Class dates | Topic | Chapter |
|------|-------------------|---|---------|
| 1 | January 7 | Course Objectives, Syllabus, Introduction | 1 |
| | January 9 | Atomic Structure and Interatomic Bonding | 2 |
| | January 11 | Atomic Structure and Interatomic Bonding/ The Structure of Crystalline Solids | 2-3 |
| 2 | January 14 | The Structure of Crystalline Solids | 3 |
| | January 16 | | |
| | January 18 | | |
| 3 | January 21 | Martin Luther King, Jr.'s Birthday | |
| | January 23 | Imperfections in Solids | 4 |
| | January 25 | Imperfections in Solids/ Diffusion | 4-5 |
| 4 | January 28 | Diffusion | 5 |
| | January 30 | Review | 1-5 |
| | February 1 | In Class Midterm Exam 1 | 1-5 |
| 5 | February 4 | Mechanical Properties of Metals | 6 |
| | February 6 | Mechanical Properties of Metals | 6 |
| | February 8 | Dislocation and Strengthening mechanisms | 7 |
| 6 | February 11 | Dislocation and Strengthening mechanisms/ Failure | 7-8 |
| | February 13 | Failure | 8 |
| | February 15 | Phase Diagrams | 9 |
| 7 | February 18 | Phase Diagrams | 9 |

| Week | Class dates | Topic | Chapter |
|------|-------------|---|---------|
| | February 20 | Phase Diagrams | 9 |
| | February 22 | Phase Transformations | 10 |
| 8 | February 25 | Phase Transformations | 10 |
| | February 27 | Review | 6-10 |
| | March 1 | In Class Midterm Exam 2 | 6-10 |
| 9 | March 4 | Spring Break | |
| | March 6 | | |
| | March 8 | | |
| 10 | March 11 | Thermal Processing of Metal Alloys and Metal Alloys | 11 |
| | March 13 | Thermal Processing of Metal Alloys and Metal Alloys/ Structure and Properties of Ceramics | 11-12 |
| | March 15 | Structure and Properties of Ceramics | 12 |
| 11 | March 18 | Ceramic Processing | 13 |
| | March 20 | Polymer Structures | 14 |
| | March 22 | Polymer Processing | 15 |
| 12 | March 25 | Composites | 16 |
| | March 27 | Review | 11-16 |
| | March 29 | In Class Midterm Exam 3 | 11-16 |
| 14 | April 1 | Corrosion and Degradation of Materials | 17 |
| | April 3 | Corrosion and Degradation of Materials/Electrical Properties | 17-18 |
| | April 5 | Electrical Properties | 18 |
| 15 | April 8 | Thermal Properties | 19 |
| | April 10 | Thermal Properties/ Magnetic Properties | 19-20 |
| | April 12 | Magnetic Properties | 19 |
| 16 | April 15 | Optical Properties | 19 |
| | April 17 | Economics, environmental issues/Review | 20 |
| | April 19 | Review | 17-22 |
| 17 | April 22 | Review | All |
| | April 24 | In Class Midterm Exam 4 | 17-22 |

