

EMA 3011 – Fundamental Principles of Materials – Spring 2021
Sections: 9765 and 9766

1. **Course Description:** The fundamental principles of structure, reactivity and energies describing materials systems will be covered, directly relating individual principles to specific materials properties or functions. (3 credit hours)

2. **Course Objectives:** In this course the student is exposed to the materials tetrahedron and its relation to the fundamental properties of materials. The student is exposed to materials selection and design.

Specific Objectives:

- Become familiar with the fundamentals of materials science and to be able to apply them to metals, ceramics, and polymers
- Learn the fundamentals of materials design and selection

3. **Prerequisites:** CHM 2046 or CHM 2096

4. **Professional Component (ABET):** This is a 3 credit course. It provides 3 credits towards engineering topics.

5. Relation to Program Outcomes (ABET):

Outcome:	Coverage*
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Medium

6. Instructor: **Dr. Jennifer Andrew**

- a. E-mail address: jandrew@mse.ufl.edu
- b. Office hours: TBD
- c. Website: <https://elearning.ufl.edu/>

7. Teaching Assistant: **Xi (Ray) Guo**

- a. Office hours location: Zoom
- b. E-mail address: xiguo@ufl.edu
- c. Office hours: TBD

8. Meeting Times and Location: **M W F 1:55p-2:45p via Zoom (links will be provided in Canvas)**

Lectures. Lectures for each week will be pre-recorded and posted on Canvas by 1:55p Monday afternoons. The Monday class time will be used for sample problems, breakout rooms, and general discussion. Participation in class on Mondays will contribute to your grade in class. These sessions will not be recorded. Specific details are included in Section 12 (Grading & Grading Scale).

Online Course Recording. Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded

during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

9. Textbooks Required

- 1a. Title: ***Fundamentals of Materials Science and Engineering: An Integrated Approach***
- 1b. Author: **William D. Callister and David G. Rethwisch**
- 1c. Edition: **5th**
- 1d. ISBN: **9781119175483**

- 2a. Title: ***Materials: engineering, science, processing, design***
- 2b. Author: **Michael Ashby, Hugh Shercliff, David Cebon**
- 2c. Edition: **4th**
- 2d. ISBN: **9780081023761**

3a. Supplemental Readings

10. On the Web: This course will use Canvas extensively as a communication and archival tool. The students can access all relevant course information (course notes, homework and exam solutions, announcements, grades, etc.) via the Canvas entry link: <https://elearning.ufl.edu/>. Pertinent course information may also be announced via UFL e-mail address in addition to over Canvas.

11. Conduct, Attendance and Expectations: Proper behavior in class is always important and leads to a relaxed and productive educational environment. Thus, eating, drinking, texting, reading of newspapers, working on homework for this or other courses, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom. Leaving your cell phone on, leaving early or arriving late can be VERY distracting. All electronic devices (cell-phones, etc.) should be turned off or in silent mode. If your cell phone rings during class it will be confiscated for the remainder of the class period. While not directly enforced, attendance is strongly recommended for this course. While attendance does not make up a specific component of the course grade, it will be reflected in homework and exam grades. Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

12. Grading and Grading Scale: Your final grade will be allocated based on the following distribution:

Participation	10%
Homework:	30%
Two In-Class Exams:	20% each
Final Design Project:	20%

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

The instructor reserves the right to adjust the grade distributions, however grades **will not** be adjusted for individuals.

Exams. You will be given 2 exams throughout the semester, the exam content may change but the dates will not. **There will be no final exam.** Each exam is weighted equally and will be worth 20% of your final grade. Requests for re-grading must be made in writing and within one week after an assignment has

been returned. **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.

Final Design Project: You will have a final design project which will involve materials selection for a given application and/or type of material. This project will include a written report.

Homework. Homework problems will be assigned, together with due dates, through e-Learning. These homework questions are *essential* to your study and some exam questions will be adapted from them. Homework will be posted through the Canvas web site. Assignments are due at the **online through Canvas in pdf. format** on the due date, unless otherwise stated. **Late homework assignments will not be accepted and will receive a grade of zero.** The lowest homework score will be dropped.

Participation. You will be expected to participate in weekly question & answer sessions. These will be held weekly on Mondays from 1:55-2:45p. For full participation credit it is expected that you will **attend and participate in a minimum of 10** of these sessions. Attendance will be taken using Zoom.

13. Course Outline: Below is the tentative schedule of topics, activities, reading assignments, and exams.

Week of	Topic	Reading (Ashby)	Reading (Callister)
11-Jan	Introduction to Materials Selection and Design	Ch.2-3	
18-Jan	Introduction to Design, Crystal Structures	Ch. 3	Ch. 3
25-Jan	Materials Tetrahedron and Materials Design via Elasticity and Plasticity	Ch. 4	Ch. 7
1-Feb	Composites		Ch. 15
8-Feb	Electronic Properties	Ch. 15	Ch. 12
EXAM 1	Friday February 19		
22-Feb	Thermal Properties, Magnetic Properties	Ch. 12, 16	Ch. 17-18
1-Mar	<i>Design Project Focus Week</i>		
8-Mar	Magnetic Properties	Ch. 16	Ch. 18
15-Mar	Corrosion		Ch. 16
22-Mar	Materials Design via Elasticity and Plasticity	Ch. 5	
29-Mar	Materials Design via Elasticity and Plasticity	Ch. 6-7	
EXAM 2	Friday April 9		
12-Apr	Materials Design via Service Condition	Ch. 8-9	
21-Apr	DESIGN PROJECTS		

14. 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 (<https://www.dso.ufl.edu/sccr/process/student-conduct-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 TAs in this class.

15. Course Evaluation - Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. 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/>.

16. Students Requiring Accommodations – Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) 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.

17. 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

18. 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.

19. 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: <https://registrar.ufl.edu/ferpa.html>

20. Campus Resources- *Health and Wellness*

U Matter, We Care:

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.

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 at 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>. 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 Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.