

Syllabus: Materials (EMA 3010)

Academic Term: Spring 2024

Class Period: MWF, 11:45 AM-12:35 PM (Period 5)

Locations: LAR 0310

Instructor

Ryan F. Need (they/them)

Office: 150 Rhines Hall

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Phone: 352-294-1690

Office Hours

TBD – Will be set during the first week of classes.

Teaching Assistants

TBD – Will be announced during the first week of classes.

Course Description

This is a 3-credit undergraduate course. Conceptual perspective for origin of materials behavior and the interrelationships of structure/property /performance. Materials selection and use of familiar material (metals, ceramics, polymers, electronic materials and composites) in electronics and structural and other engineering applications.

Course Pre-Requisites / Co-Requisites

CHM 2045 (or equivalent)

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 how to select materials for a given application.

Materials and Supply Fees

None

Required Textbooks and Software

- Title: Fundamentals of Materials Science and Engineering: An Integrated Approach
- Author: William D. Callister Jr. and David G. Rethwisch
- Publication date and edition: 2015, Wiley 6th Edition
- ISBN number: 979-8-203-26676-7

PLEASE NOTE: You need to acquire the e-book version with access to zyBooks, as this online tool will be used for assessment as described below. The simplest and affordable way to acquire the e-book is via UF ALL ACCESS. This includes a UF Negotiated rate for both products of \$58.

Login at the following website and Opt-In to gain access to your UF All Access course materials (<https://www.bsd.ufl.edu/AllAccess>). UF All Access will provide you with your required materials digitally at a reduced price, and the charge will be posted to your student account. This option will

be available starting one week prior to the start of the semester and ends three weeks after the first day of class.

Course Website

This course will use CANVAS extensively as a communication and archival tool. Students can access all relevant course information (course notes, homework, problem sets, solutions, announcements, grades, etc.) via the CANVAS. Please check CANVAS frequently.

Professional Component (ABET): 3 credits Engineering Topics.

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
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.	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Course Schedule (subject to change)

Week	Class	Class Date	Topic	Chapter
1	Module 1: Bonding and Structure			
	1	1/8	Course objectives, syllabus, software/app introduction	0
	2	1/10	Introduction to materials science	1
	3	1/12	Atomic structure and interatomic bonding	2
2		1/15	No Class – Martin Luther King Day	
	4	1/17	ICE 1: Atomic structure and interatomic bonding	2
	5	1/19	Structures of metals, ceramics	3
3	6	1/22	Structures of metals, ceramics	3
	7	1/24	ICE 2: Structures of metals, ceramics	3
	8	1/26	Structures of polymers	4
4	9	1/29	Structure of polymers	4
	10	1/31	ICE 3: Structures of polymers	4
	11	2/2	Review lecture	1 - 4
5	12	2/5	Exam #1 (in class; lectures 1 – 11; 11 lectures)	
	Module 2: Imperfections and Diffusion			
	13	2/7	Imperfections in solids	5
	14	2/9	Imperfections in solids	5
6	15	2/12	ICE 4: Imperfections in solids	5
	16	2/14	Diffusion	6
	17	2/16	Diffusion	6
7	18	2/19	ICE 5: Diffusion	6
	19	2/21	Review lecture	5 – 6
	20	2/23	Exam #2 (in class; lectures 13 – 19; 7 lectures)	
8	Module 3: Mechanical Properties			
	21	2/26	Mechanical properties	7
	22	2/28	Mechanical properties	7
	23	3/1	ICE 6: Mechanical properties	7
9	24	3/11	Deformation and strengthening mechanisms	8
	25	3/13	ICE 7: Deformation and strengthening mechanisms	8
	26	3/15	Failure	9
10	27	3/18	ICE 8: Failure	9
	28	3/20	Review lecture	7 – 9
	29	3/22	Exam #3 (in class; lectures 21 – 28; 7 lectures)	7 – 9
11	Module 4: Phase Diagrams and Phase Transformations			
	30	3/25	Phase diagrams	10
	31	3/27	Phase diagrams	10
	32	3/29	ICE 9: Phase diagrams	10
12	33	4/1	Phase transformations	11
	34	4/3	ICE 10: Phase transformations	11
	35	4/5	Review lecture	10 – 11
13	36	4/8	Exam #4 (in class; lectures 20– 35; 6 lectures)	10 – 11
	Module 5: Applications, Composites, Impact of Materials			
	37	4/10	Types and applications of materials	13
	38	4/12	Composites	15
14	39	4/15	ICE 11: Composites	15

15	40	4/17	Economic, environmental and societal issues in MSE	20
	41	4/19	ICE 12: Economic, environ. and societal issues in MSE	20
	42	4/22	Review lecture	13, 15, 20
	43	4/24	Exam #5 (in class; lectures 37 – 42; 6 lectures)	13, 15, 20

Course Format

This course uses a ***partially-flipped classroom approach*** that incorporates pre-class preparation materials (including watching pre-recorded lectures and reading assignments) to enable some live class time to be dedicated to In-Class Exercises (ICEs) and discussions. Your completion of these preparatory assignments prior to the live class time is critical to success in the ICEs and the course.

Pre-Class Preparation Materials (25% of final grade)

- ***Pre-Recorded Video Lectures*** will help you prepare for the learning activities and assessments. You are required to watch them and answer comprehension questions for each video using PlayPosit. These video lecture assignments will be worth 10% of your final grade.
- ***Reading Assignments*** will also help you prepare for the active learning activities and are another critical aspect of learning the course content. Your completion of the reading will be worth 15% of your final grade and will be assessed using zyBooks.

Learning Activities & Assessments (75% of final grade)

- ***In Class Exercises (ICEs)*** will be given during the live classes. These exercises will be counted for credit and will be worth 15% of the grade in total.
- ***Practice Homework*** will be provided to help students prepare for the exams, but they are not required and do not count towards your final grade.
- ***Exams*** will be the primary form of individual assessment in this course. There will be five, non-cumulative exams covering content roughly as shown in the Course Schedule above. Exams will be administered in Canvas but given during a live class period. Each exam is weighted equally and worth 12% of your final grade (together = 60% of your final grade).

Exam Notes:

1. You have one week after the test results are posted to raise any questions about scores and grades with the instructor. No changes to your exam grade will be made after that time.
2. The official UF policy on exam conflict resolution states that when two exams conflict (are at the same time), the course with the higher number will take priority. This rule will be used as the default procedure, though exceptions may be made in extenuating circumstances.
3. Students who miss an exam will receive a grade of 0. Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

All unexcused missed assignments that are not exams (video lectures, reading assignments, and ICEs) will be accepted up to 48 hrs late. For assignments submitted 0-24 hrs late, a 50% penalty is imposed. For assignments submitted 24-48 hrs late, a 75% penalty is imposed. Assignments submitted more than 48 hrs late will receive a zero.

Attendance to Live Classes is not required or graded directly, but it is highly encouraged since there will be helpful discussions and graded In Class Exercises.

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

Evaluation of Grades

Assignment Category	Platform	Number of Assignments	Percentage of Final Grade
Lecture Video Assignments	PlayPosit/Canvas	~12	10%
Reading Assignments	zyBooks	~12	15%
In-Class Exercises	Canvas or	~12	15%
Midterm Exams	Canvas (LockDown Browser)	5 (12% each)	60%
Total			100%

Grading Policy

Percent	Grade	Grade Points
92.0-100	A	4.00
88.0-91.9	A-	3.67
84.0-87.9	B+	3.33
80.0-83.9	B	3.00
76.0-79.9	B-	2.67
72.0-75.9	C+	2.33
68.0-71.9	C	2.00
65.0-67.9	C-	1.67
62.0-64.9	D+	1.33
59.0-61.9	D	1.00
56.0-58.9	D-	0.67
0.0-55.9	E	0.00

More information on UF grading policy may be found at:

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

Syllabus Changes

The instructor reserves the right to make changes to the syllabus as needed. Any changes will be clearly announced on Canvas.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation with the instructor and discuss their needs, as early as possible in the semester.

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/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session. Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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 (<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.

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

Campus Resources

Technology Resources

The entirety of our course will take place virtually, requiring the use of a working computer and access to audio-visual resources (webcam, microphone, speakers). If you are struggling to use Zoom or Canvas, please review these [UF Quick Start guides](#). This [link](#) also connects to UF resources regarding internet connectivity.

The UF Computing Help Desk can assist you with any of your technical issues. You can access the Help Desk 24/7 at <https://helpdesk.ufl.edu/>, 352-392- HELP (4357), or helpdesk@ufl.edu. If you use email, write from your gatorlink@ufl.edu email address, or include your UFID and/or GatorLink username (NOT your password!) in the body of the email. Provide complete information regarding the course and content to which you are referring.

Financial and COVID Related Services

In case of emergency financial need, UF's Aid-a-Gator program provides students with emergency funding: <https://www.sfa.ufl.edu/aidagator/>. The program is intended to "help our students need to cover costs related to unanticipated travel, additional technology requirements, or other needs related to an emergency situation."

Health and Wellness

If you or someone you know is struggling with any crisis including but not limited to gender, sexual, racial, or domestic violence, there are many community and University of Florida resources available. Some of these include:

- *RESPECT – UF Division of Student Affairs* (respect.ufsa.ufl.edu)
- *Student Health Care Center* (352-392-1161, shcc.ufl.edu)
- *Multicultural & Diversity Affairs* (352-392-1217, multicultural.ufl.edu)
- *UF Health Shands Emergency Room / Trauma Center* (352-733-0111)
- *Gainesville Police Department* (non-emergency #: 352-955-1818, gainesvillepd.org)

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.

Hitchcock Field & Fork Pantry: <https://pantry.fieldandfork.ufl.edu>, assisting members of our campus community who experience food insecurity.

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. While faculty and staff in our department are also resources for you, please keep in mind that most are Title IX mandatory reporters.

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>.