

## **Materials**

EMA 3010 Section 1938 (24349)

### **Class Periods:**

M,W,F – Period 8 (3:00 pm – 3:50 pm)

### **Location:**

PUGH 170

**Academic Term:** Spring 2023

### **Instructor:**

Aroba Saleem

[aroba.saleem@ufl.edu](mailto:aroba.saleem@ufl.edu)

352-294-1789

Office Hours: TBD

### **Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

- TBA

### **Course Description**

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**

N/A

### **Relation to Program Outcomes (ABET):**

<b>Outcome</b>	<b>Coverage*</b>
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	

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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***

- Title : Fundamentals of Materials Science and Engineering: An Integrated Approach
- Author : William D. Callister and David G. Rethwisch
- Publication date and edition: 2015, Wiley 5<sup>th</sup> Edition
- ISBN number: 9781119035640

PLEASE NOTE: You need to acquire the e-book version with access to both Wiley Plus and Perusall as these online tools will be used for assessment as indicated in the evaluation of grades and will provide you with additional learning tools. **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 \$87.50.** 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 entry link: <https://elearning.ufl.edu/> or <https://ufl.instructure.com>. Within CANVAS the students can purchase and access the book as well as Perusall and Wiley Plus. Please check CANVAS frequently.

### Course Schedule

This course is synchronous, face-to-face. Below is the intended/tentative schedule of classes and exams.

Week	Class #	Class Date	Topic	Chapter
1	<b>Module 1</b>			
	1	January 9	Course objectives, syllabus, Wiley introduction	0
	2	January 11	Introduction	1
	3	January 13	Atomic structure and interatomic bonding	2
2		January 16	No Class – Martin Luther King Day	
	4	January 18	Atomic structure and interatomic bonding	2
	5	January 20	Structures of metals, ceramics	3
3	6	January 23	Structures of metals, ceramics	3
	7	January 25	Structures of metals, ceramics	3
	8	January 27	Structures of polymers	4
4	9	January 30	Structure of polymers	4
	10	February 1	Structures of polymers	4
	11	February 3	Review lecture	1 - 4
5	12	February 6	<b>Exam #1 (In class)</b>	
	<b>Module 2</b>			
	13	February 8	Imperfections in solids	5
	14	February 10	Imperfections in solids	5
6	15	February 13	Imperfections in solids	5
	16	February 15	Diffusion	6
	17	February 17	Diffusion	6
7	18	February 20	Diffusion	6
	19	February 22	Review lecture	5 – 6
	20	February 24	<b>Exam #2 (In class)</b>	
8	<b>Module 3</b>			
	21	February 27	Mechanical properties	7
	22	March 1	Mechanical properties	7
	23	March 3	Mechanical properties	7
9	24	March 6	Deformation and strengthening mechanisms	8
	25	March 8	Deformation and strengthening mechanisms	8
	26	March 10	Failure	9
10	27	March 20	Failure	9
	28	March 22	Review lecture	7 – 9
	29	March 24	<b>Exam #3 (In class)</b>	7 – 9
11	<b>Module 4</b>			
	30	March 27	Phase diagrams	10

	31	March 29	Phase diagrams	10
	32	March 31	Phase diagrams	10
	33	April 3	Phase transformations	11
12	34	April 5	Phase transformations	11
	35	April 7	Review lecture	10 – 11
13	36	April 10	<b>Exam #4 (In class)</b>	10 – 11
	<b>Module 5</b>			
	37	April 12	Types and Applications of Materials	13
	38	April 14	Composites	15
14	39	April 17	Composites	15
	40	April 19	Economic, environmental and societal issues in MSE	20
	41	April 21	Economic, environmental and societal issues in MSE	20
15	42	April 24	Review Lecture	13, 15, 20
	43	April 26	<b>Exam #5 (In class)</b>	13, 15, 20

### Course Format

This course uses a *team-based learning approach* that uses pre-class preparation materials (including watching pre-recorded lectures and reading assignments) and live lectures. The class time will be dedicated to lectures and/or In-Class Exercises and Discussions. Your completion and involvement in all these aspects of the course is critical to success.

### Pre-Class Preparation Materials

**Pre-Recorded Lectures** will help you prepare for the active learning activities and are a critical aspect of learning the content of this course. You are required to watch them using Perusall. Whether and how you watch and interact with the lectures will be evaluated and will be worth 15% of the 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 grade and will be assessed using Perusall.

### Active Learning Activities

**Attendance to Live Classes** is not required but highly encouraged since there will be discussion individual and group work on graded In Class Exercises. Students are encouraged to ask questions and participate. The fundamental concepts will be repeated as required.

**In Class Exercises (ICE)** will be given during the live classes. These exercises will be counted for credit and will be worth 20% of the grade.

### Homework Problems

Homework is not required for this course. However, suggested homework problems will be provided via Canvas (WileyPlus) to help students prepare for the exams. These problems are not required and no credit will be awarded.

## Exams

There will be 5 exams throughout the semester. Exams will in class. 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 **10%** of your final grade.

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.

## 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 who do not take 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.

## Syllabus Changes

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

## 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	Percentage of Final Grade
Reading (Perusall)	15%
Prerecorded Lecture (Perusall)	15%
In-Class Exercises	20%
Midterm Exams	50%
<b>Total</b>	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>

### ***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 letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-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 Conduct Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. 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
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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:***

### ***COVID-19***

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email [covid@shcc.ufl.edu](mailto:covid@shcc.ufl.edu)) to be evaluated for testing and to receive further instructions about returning to campus.
- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the [UF Health Screen, Test & Protect website](#) for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

### ***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](mailto: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:** <https://counseling.ufl.edu>, 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](mailto: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](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling;  
<https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

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