

Introduction to Materials Science and Engineering

EMA 3010 Section 3111 (22619)

Class Periods: Asynchronous, students can study at any time.

Location: 100% online on CANVAS

Academic Term: Fall 2020

Instructor:

Name Wolfgang Sigmund

Email Address: sigmund@ufl.edu

Office Phone Number: 352-846-3343

Office Hours: Wednesdays from 10 am to noon and via email requests. Meetings are on Zoom.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

Course Description

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

Materials and Supply Fees

N/A

Professional Component (ABET):

3 credits Engineering Topics

Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

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.

Required Textbooks and Software

- Title : Fundamentals of Materials Science and Engineering: An Integrated Approach [SEP]
- Author : William D. Callister and David G. Rethwisch [SEP]
- Publication date and edition: Wiley 5th Edition [SEP]
- ISBN number : 9781119035640 [SEP]
- Students: Please note that this course will be participating in the UF All Access program. Login at <https://www.bsd.ufl.edu/G1CO/!Pay1f/start.aspx?TASK=INCLUDED> and Opt-In to gain access to your required course materials - UF All Access will provide you with your required materials digitally at a reduced price and the charges will post directly to your student account, allowing any available Financial Aid funds to cover the cost of your materials. This option will be available starting 1 week prior to the first day of classes and ending 3 weeks after the first day of class

Recommended Materials

- Title : Understanding Materials Science
- Author : Rolf Hummel
- Publication date and edition : 1998, Springer 1st Edition
- ISBN number : 0387983031
- Title : Essentials of Modern Materials Science and Engineering [SEP]
- Author : James Newell [SEP]
- Publication date and edition : 2009, Wiley 1st Edition

Course Schedule

This course is asynchronous. This allows students to study at their own pace, i.e. the list below gives the slowest pace for watching the videos and doing the work. This is also an honors class, i.e. additionally assignments and meetings with the instructor and the student groups will be necessary. You may need about 1 h extra time per week to do the honor's class assignment including Zoom meetings with the instructor. The meeting times will be scheduled with individual groups to fit all our schedules.

Week	Topic	Chapter
1	Course Objectives, Syllabus, Wiley Introduction	0
	Introduction/ Atomic Structure and Interatomic Bonding	1-2
	Atomic Structure and Interatomic Bonding	2
2	Labor Day	
	Structure of metals, ceramics	3
	Structure of metals, ceramics	3

Week	Topic	Chapter
3	Structure of metals, ceramics	3
	Structure of metals, ceramics	3
	Structure of metals, ceramics	3
4	Structure of Polymers	4
	Structure of Polymers	4
	Structure of Polymers	4
5	Defects in Solids	5
	Defects in Solids	5
	Homecoming	
6	Diffusion	6
	Diffusion	6
	Diffusion	6
7	Mechanical Properties	7
	Mechanical Properties	7
	Mechanical Properties	7
8	Review lecture	1-7
	Oral exam on zoom scheduled individually	1-7
	Deformation and strengthening mechanisms	8
9	Deformation and strengthening mechanisms	8
	Deformation and strengthening mechanisms	8
	Failure	9
10	Failure	9
	Failure	9
	Phase Diagrams	10
11	Phase Diagrams	10
	Veteran's Day	
	Phase Diagrams	10
12	Phase transformations	11
	Phase transformations	11
	Review	8-11
13	Oral exam on zoom scheduled individually	8-11

Week	Topic	Chapter
	Thanksgiving	
	Thanksgiving	
14	Types and Applications of materials/ Synthesis, fabrication, and processing of materials	13-14
	Types and Applications of materials/ Synthesis, fabrication, and processing of materials	13-14
	Composites	15
15	Composites	15
	Wrap up/ Last day of class	
	No class	

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.

Attendance Policy, Class Expectations, and Make-Up Policy

The class is 100% online. You can take the modules and listen to the lectures at any time. There is no attendance required other than the oral exam appointment and the group meetings. A computer, laptop and internet access is required to be able to access the class and submit your work. There is only practice homework and no graded homework and there are no graded quizzes. Reflection papers are due for specific chapters. If an oral exam appointment that the instructor and the student agreed upon is missed without prior notice by the student, it counts as 0 points towards the grade. If the deadline for the term project submission is missed, without prior notice to the instructor, it counts as 0 points towards the grade. If a student gives advanced notice, an extension can be granted if it falls under the university policies given below. For computer/internet problems a UFIT trouble ticket is required with a time stamp before the deadline or meeting. 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.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (15)	100 each	15%
Reflection sets (5)	100 each	20%
Midterm Oral Exam	100	20%
Last Oral Exam	100	20%
Term Project	100	25%
		100%

Grading Policy

Percent	Grade	Grade Points
92.0 - 100.0	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 - 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.aa.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.aa.ufl.edu/public-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 (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-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:

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](mailto:title-ix@ufl.edu), 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://care.dso.ufl.edu>.

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