

Properties of Materials

EMA 6001

Class# 13224, 21665, 19847, 19744

Sections: CAMP, OVER, 2FED, 1FE2

Class Periods: M, W, F, Period 2, 8:30 am-9:20 am and online fully asynchronous.

Location: CANVAS and for assembly exams CSE E118

Academic Term: Fall 2022

Instructor:

Name: Wolfgang Sigmund, PhD.

Email Address: sigmund@ufl.edu

Office Location: Rhines Hall 225A

Office Phone Number: 352-846-3343

Office Hours: Wednesday from 12:45 pm to 1:45 pm via zoom. Additional meeting times available via email request.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

None

Course Description

Review of materials science and engineering fundamentals. The student will learn how thermodynamics and kinetics yield specific microstructures and properties via processing. How atomistic, unit cell, defect, and molecular structures impact macroscopic structures and their properties such as magnetic, thermal, optical, mechanical, and electrical properties as well as the structures' chemical and electrochemical (in)stability. The course will end with a look at economic, environmental, and societal issues in materials science and engineering.

Course Pre-Requisites / Co-Requisites

Bachelor's degree in physics, chemistry, or engineering

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, photonic and other properties for applications.

Materials and Supply Fees

N/A

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: 2019, Wiley 5th Edition
ISBN number: 9781119035640
- This course participates in the UF All Access program. 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 <https://www.bsd.ufl.edu/G1CO/IPay1f/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; 1998, Springer, 1st Edition, ISBN number: 0387983031
- Title: Essentials of Modern Materials Science and Engineering Author: James Newell; 2009, Wiley, 1st Edition

Course Schedule

This course is 99% online for CAMP. Lectures are on zoom or media files on CANVAS. Section CAMP (13500) has three in class exams. All other sections have three proctored or Honorlock exams and are 100% online.

Below is the tentative schedule of classes and exams.

W	Class dates	Topic	Chapter
1	August 24	Course Objectives, Syllabus, Wiley Introduction	0/1
	August 26	Atomic Structure and Interatomic Bonding	2
2	August 29	Structure of metals, ceramics	3
	August 31	Structure of metals, ceramics	3
	September 2	Structure of Polymers	4
3	September 7	Structure of Polymers	4
	September 9	Defects in Solids	5
4	September 12	Defects in Solids	5
	September 14	Diffusion	6
	September 16	Diffusion	6
5	September 19	Review Lecture	1-6
	September 21	EXAM 1	1-6
	September 23	Mechanical Properties	7
6	September 26	Mechanical Properties	7
	September 28	Deformation and strengthening mechanisms	8
	September 30	Deformation and strengthening mechanisms	8
7	October 3	Failure	9
	October 5	Failure	9
8	October 10	Phase Diagrams	10
	October 12	Phase Diagrams	10
	October 14	Phase Diagrams	10
9	October 17	Phase Transformations	11
	October 19	Phase Transformations	11
	October 21	Electrical Properties	12
10	October 24	Electrical Properties	12
	October 26	Review Lecture	7-12
	October 28	EXAM 2	7-12
11	October 31	Types and Applications of Materials	13
	November 2	Synthesis, Fabrication and Processing	14
	November 4	Synthesis, Fabrication and Processing	14
12	November 7	Composites	15
	November 9	Composites	15
13	November 14	Corrosion and Degradation	16
	November 16	Thermal Properties	17
	November 18	Thermal Properties	17
14	November 21	Magnetic Properties	18
15	November 28	Magnetic/Optical Properties	18/19
	November	Optical Properties	19
	December 2	Economic, Environmental, Societal Issues in MSE	20
16	December 5	Review Lecture	13-20
	December 7	EXAM 3	13-20

There is no final exam. Exams are not comprehensive.

Course Format

This course uses a *team-based learning approach* via PERUSALL and other group work tools that uses pre- and post-class assignments (including watching pre-recorded lectures, reading assignments, homework) and live lectures on zoom. For EDGE students the live sessions will be recorded and available offline in CANVAS. The class time will be dedicated to lectures and/or exercises/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 via the CANVAS course website. Whether you watch and interact with the lectures will be evaluated and will be worth 10% 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 10% 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. Students are encouraged to ask questions and participate. The fundamental concepts will be repeated as required.

In Class Exercises will be given during the live classes. These exercises will not count for credit since most of the students are offline and asynchronous.

Homework Problems

Homework problems are available and suggested to be studied in groups. It is best for learning when students explain to each other what they just learned in their own words. WileyPlus in CANVAS is programmed to provide feedback to the student(s) and give detailed solutions and guidance to problem solving. Students are encouraged to make use of these tools. A grade is not assigned to homework. The homework will help the student to prepare for exams.

Exams

There will be 3 exams throughout the semester. Your lowest exam grade will be dropped. The exam content may change, and the dates are tentative and will be finalized after the add/drop period. Online students (EDGE) will have one week to complete the exam.

Each exam is weighted equally, and each exam will be worth **30%** of your final grade.

You have one week 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 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. Since the lowest exam score of three exams is dropped students may only take two exams if they are satisfied with their grade. Furthermore, exams are available for 5 business days plus a weekend and can be taken at any time during the day or night.

Syllabus Changes

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

Evaluation of Grades

Assignment	Number of Assignments	Percentage of Final Grade
Reading (Perusall)	About 20	10%
Prerecorded lectures (Perusall)	About 60	10%
Term group project	1	20%
Exams	3 (30% each, drop the lowest)	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
0.00 – 55.9	E	0.00

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)
[Grades and Grading Policies](#)

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/>.

Online Course Recording

Our class sessions will 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.

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
- 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: <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

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://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: : <https://distance.ufl.edu/state-authorization-status/#student-complaint>.