Materials of Chemical Engineering

ECH4824 Section MCHE
Class Periods: T | Period 2-3 (8:30 AM – 10:25 AM)
Location: CSE E221
Academic Term: Spring 2022

Instructor:
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Office Hours: ChE 215, TBD

Teaching Assistant/Peer Mentor/Supervised Teaching Student:
Please contact through the Canvas website

- TBD

Course Description
Relations between microscopic structure and macroscopic mechanical, thermal, and electrical properties of organic and inorganic solid materials widely used for chemical engineering. Practical problems including engineering applications and corrosions. (2 credits)

Course Pre-Requisites / Co-Requisites
ECH 3264: Elementary Transport Phenomena

Course Objectives
Upon completion of this course, a student should be able to:

a. Have a broad technical understanding of material properties, behavior, and processing
b. Define the mathematical expression to explain material behavior
c. Qualitatively describe how material performance can be enhanced by controlling the atomic and molecular structure and composition of the material
d. Apply chemical engineering science (e.g., thermodynamics, transport, and kinetics) to the understanding of material processing, properties, and failure (corrosion)
e. Estimate how much force can be applied before a specific material fails
f. Identify modes of failure and conditions that trigger material failure
g. Describe methods of characterizing the structure and properties of materials
h. Give examples of the importance of material properties as they benefit mankind
i. Give examples of the role material failure has played in technological disasters
j. Select materials of construction appropriate to specific operating environments
k. Apply this knowledge to rationally design a new material for advanced applications

Materials and Supply Fees
Course materials, homework assignments, and important announcements and grading policies will be posted on Canvas. Check it regularly.

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	Medium

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	High

*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: Foundation of Materials Science and Engineering
- Author: William F. Smith and Javad Hashemi
- Publication date and edition: 2010 and 5th Edition (The 6th Edition is also acceptable)
- ISBN number: 978-0-07-352924-0

Course Schedule

Week	***Date***	***Topic***	***Reading***	***HW/Quiz/ Exam***
1	1/11 (Tue)	Crystal and amorphous structure in materials	Ch 3	
2	1/18 (Tue)	Crystal and amorphous structure in materials	Ch 3	HW 1
3	1/25 (Tue)	Solidification of metals	Ch 4	Quiz 1
4	2/1 (Tue)	Crystalline imperfections	Ch 4	HW 2
5	2/8 (Tue)	Atomic diffusion in solids & Oxidation	Ch 5	
6	2/15 (Tue)	Atomic diffusion in solids & Oxidation	Ch 5	HW 3
7	2/22 (Tue)	Mechanical properties including stress and strain, tensile test, and elastic and plastic deformation	Ch 6	Quiz 2
8	3/1 (Tue)	Mechanical properties including strengthening, recovery and recrystallization	Ch 6	HW 4
9	3/8 (Tue)	No class – Spring Break		
10	3/15 (Tue)	Midterm – Covering Chapters 3, 4, 5, 6		
11	3/22 (Tue)	Classification of Polymers	Ch 10	HW 5
12	3/29 (Tue)	Corrosion including Galvanic cells, corrosion rates, types of corrosion, passivation	Ch 13	Quiz 3
13	4/5 (Tue)	Semiconductor devices	Ch 14	
14	4/12 (Tue)	Surface Analysis including SEM, TEM, and XRD		HW 6
15	4/19 (Tue)	Bioinspired Materials	Ch 17	Quiz 4
16	4/25 (Mon)	Final – Covering Chapters 10, 13, 14, 17 (10 AM – 12 PM on Monday)		

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance of all lectures is highly expected and recommended. Lecture notes will be only provided during the lecture on a blackboard. It is the students' responsibility to obtain lecture notes in class, which they may have missed during their absence. Repeated absences may lead to a lower grade in the class.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

No make-up exams and quizzes will be given. Students who do not attend an exam at the scheduled time will receive a score of zero for that exam. Exceptions will be made only in extraordinary circumstances, such as religious holidays or emergencies. It is required that, whenever possible, the student notifies the instructor about the situation prior to the exam, preferably at least two weeks in advance.
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.
As a courtesy to the other students and to the instructor, the students should turn off the ringers for all cell phones during class and they should not answer incoming calls. If a student is expecting an emergency call, please notify the instructor prior to class.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (6)	20 each	24%
Quizzes (4)	20 each	16%
Midterm	150	30%
Final	150	30%
Total	500	100%

HOMEWORK: 6 homework sets will be assigned throughout the semester. The homework must be prepared neatly and professionally. Write only on one side of paper and use a straightedge for diagrams. Staple all pages together. Students are encouraged to help each other on HW (but no copy!). The HW is due one week after the assignment and must be turned in at the beginning of class on the due date. No later credit will be issued on HW.

QUIZZES: 4 quizzes (20-25 minutes each) are equally weighted. All quizzes will be closed book and closed notes. In class quizzes will be announced at least 1 week in advance.

MIDTERM & FINAL: 2 hours will be assigned during the class period. The exams will be closed book. You will be allowed to bring one sheet of paper (8.5 × 11 inch, one-side only) for formulas. Partial credit will be assigned. No credit will be given for problems that have a solution only but all the work leading to this solution is not shown or wrong.

Grading Policy

Percent	Grade	Grade Points
94.0 - 100	A	4.00
88.0 - 93.9	A-	3.67
82.0 - 87.9	B+	3.33
78.0 - 81.9	B	3.00
72.0 - 77.9	B-	2.67
66.0 - 71.9	C+	2.33
60.0 - 65.9	C	2.00
55.0 - 59.9	C-	1.67

50.0 - 54.9	D+	1.33
45.0 - 49.9	D	1.00
40.0 - 44.9	D-	0.67
0 - 39.9	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.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.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
- 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/.

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) 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.

Academic Resources

E-learning technical suppor*t*, 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*:* http://www.distance.ufl.edu/student-complaint-process.