

## Materials of Chemical Engineering

ECH 4824

**Class Periods:** R, Period 10-11 (5:10 PM ~ 7:05 PM)

**Location:** FLG 0230 (Florida Gym)

**Academic Term:** Fall 2019

### **Instructor:**

Prof. Yeongseon Jang

[y.jang@ufl.edu](mailto:y.jang@ufl.edu), (352) 294-1289

Office Hours: ChE 215, R (9:30 AM ~ 11:30 AM)

Please contact through the Canvas website

### **Supervising Teacher (ST):**

- Samuel Berens, [samuelberens@ufl.edu](mailto:samuelberens@ufl.edu)
  - Office Hours: TBA
  - Please contact through the Canvas website

### **Course Description**

Relations between microscopic structure and macroscopic mechanical, thermal and electrical properties of organic and inorganic solids. Engineering applications, including corrosion. (Credits: 2)

### **Course Pre-Requisites / Co-Requisites**

ECH 3023 (Material and Energy Balances) and ECH 4123 (Phase and Chemical Equilibria)

### **Course Objectives**

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

- Have a broad technical understanding of material properties, behavior, and processing
- Define the mathematical expressions that define material behavior such as stress, strain, Young's modulus
- Qualitatively describe how material performance can be enhanced by controlling the atomic and molecular structure of the material
- Apply chemical engineering science (e.g., thermodynamics, transport, and kinetics) to understanding of materials processing, properties, and failure
- Estimate how much force can be applied before a specific material fails
- Identify modes of failure and conditions conducive to material failure
- Describe methods for characterizing the structure and properties of materials
- Give examples of the importance of material properties as they benefit mankind
- Give examples of the role material failure has played in technological disasters
- Select materials of construction appropriate to specific operating environments
- Apply this knowledge to rationally design a new material for advanced applications

### **Materials and Supply Fees**

None

### **Professional Component (ABET):**

The contribution of the course to meeting the professional components of the ABET-accredited degree is as follow.

- To instill technical competence in mathematics, science, and engineering
- To develop problem solving skills
- To develop an ability to apply knowledge to practice
- To instill an ability to design a component, unit, or process that meets performance specifications
- To develop an ability to design and to conduct experiments, as well as to analyze and interpret the data
- To instill an ability to use the techniques, skills, and modern engineering tools necessary for chemical engineering practice

- G. To develop communication skills
- H. To instill an ability to work well with others, including coworkers of different disciplines and coworkers of different nationality or cultural background
- I. To instill professional ethics
- J. To provide opportunities to obtain the broad background, including contemporary issues, necessary to understand the impact of engineering solutions in a global and societal context.
- K. To instill an ability to engage in life-long learning

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

Program Objectives →	A	B	C	D	E	F	G	H	I	J	K
↓ Course Objectives											
a	×					×					
b	×	×				×					
c	×	×	×	×		×					
d	×	×	×			×					
e	×	×	×	×		×					
f	×	×	×	×		×					
g	×	×	×	×	×	×					
h	×					×			×	×	×
i	×					×	×	×	×	×	×
j	×		×	×		×					
k							×	×	×		

**Required Textbooks and Software**

- Title: Foundations of Materials Science and Engineering
- Author: William F. Smith and Javad Hashemi
- Publication date and edition: 2010 and 5th edition
- ISBN number: 978-0-07-352924-0

**Recommended Materials**

- Title: Introduction of Materials Science and Engineering
- Author: James F. Shackelford
- Publication date and edition: 2000 and 5<sup>th</sup> edition
- ISBN number: 0-13-011287-9

**Course Schedule**

Wk	Date	Topic	Reading	HW/Quiz/Exam
1	8/22	Crystal and Amorphous Structure in Materials	Ch.3	
2	8/29	Crystal and Amorphous Structure in Materials	Ch.3	HW #1 Assigned
3	9/5	Solidification and Crystalline Imperfections	Ch.4	<b>Quiz #1 (Ch.3)</b> , HW #2 Assigned
4	9/12	Thermally Activated Process and Diffusion in Solids	Ch.5	
5	9/19	Thermally Activated Process and Diffusion in Solids	Ch.5	HW #3 Assigned
6	9/26	Mechanical Properties of Metals I	Ch.6	<b>Quiz #2 (Ch.4&amp;5)</b>
7	10/3	Mechanical Properties of Metals I	Ch.6	HW #4 Assigned
8	10/10	<b>Mid-Term (Covering Chapters 3-6)</b>		
9	10/17	Corrosion	Ch.13	
10	10/24	Corrosion	Ch.13	HW #5 Assigned
11	10/31	Electrical Properties of Materials	Ch.14	<b>Quiz #3 (Ch. 13)</b>

12	11/7	Electrical Properties of Materials	Ch.14	HW #6 Assigned
13	11/14	Polymeric Materials	Ch.10	<b>Quiz #4 (Ch. 14)</b>
14	11/21	Biological Materials and Biomaterials	Ch.17	HW #7 Assigned
15	11/28	No Class (Thanksgiving Holiday)		
16	12/5	<b>Final Exam (Covering Chapters 10, 13, 14, 17)</b>		

### ***Attendance Policy, Class Expectations, and Make-Up Policy***

Attendance of all lectures is highly recommended. It is the student's responsibility to obtain any notes, assignments, etc. that they may have missed during their absence. Repeated absences may lead to a lower grade in the class. 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.

Makeup exams and quizzes will be given only in case of an emergency – **documentation of the emergency has to be provided**. 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.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework Sets (7)	100 each	10 %
Quizzes (4)	100 each	20 %
Mid-term	100	30 %
Final Exam	100	40 %
<b>Total</b>		100%

**Homework Sets:** 7 homework sets will be assigned throughout the semester. Five highest scores which are equally weighted will be used in calculating your final grade. 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 (but not copy!) each other on HW. **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 (15 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.

**Mid-term and Final exam:** 2 hr will be assigned during the class period. The exams will be **closed book and closed notes**. You will be allowed to bring one sheet of paper (8.5×11 inch, one side only) for formulas. Partial credit will be assigned, and no credit will be given for problems that have a solution but all the work leading to this solution is not shown.

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
100 - 90	A	4.00
85 - 89	A-	3.67
80 - 84	B+	3.33
75 - 79	B	3.00
70 - 74	B-	2.67
65 - 69	C+	2.33

60 - 64	C	2.00
55 - 59	C-	1.67
50 - 54	D+	1.33
45 - 49	D	1.00
40 - 44	D-	0.67
0 - 39	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 requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure 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/>.

### ***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.

### ***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: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.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](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:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

#### **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://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](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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