

Standardized Syllabus for the College of Engineering

EMA 6313
(7165 & EDGE)

Advanced Materials Principles I

Fall 2014

1. **Course Description:** The course will cover fundamental principles governing the properties of materials including bonding, crystal structure, and defects. Through application of key thermodynamic and kinetic principles, phase equilibria and phase transformations in materials will be discussed. The mechanical properties of materials will be covered as well. (3 Credit Hours)
2. **Course Objectives:** At the end of the course the students should be familiar with the most important fundamental material science and engineering concepts and will be able to apply these concepts when addressing general and critical problems in materials science and engineering. In addition, the course will serve students as partial tool in their preparation for the MSE proposal defense examination towards Ph.D. Candidacy admission.
3. **Instructor: Dr. Juan C. Nino**
 - a. Office location: **172 Rhines Hall**
 - b. Telephone: **(352) 846 3787**
 - c. E-mail address: **jnino@mse.ufl.edu**
 - d. Office hours: **M,W 10:00-11:00 am; via e-mail or by appointment**
4. **Teaching Assistant: Soumitra Sulekar**
 - a. Office location: 159 Rhines Hall
 - b. Telephone: (352) 410 2735
 - c. E-mail address: soumitrasulekar@ufl.edu
 - d. Office hours: **M,W 11:00-12:00 am; via e-mail or by appointment**
5. **Meeting Times: T 1:55 – 3:50 pm, R 1:55 – 2:45 pm**
6. **Meeting Location: NEB 0100**
7. **Textbooks**

Required:

 - a. Title: An Introduction to Materials Engineering and Science for Chemical and Materials Engineers
 - b. Author: Brian S. Mitchell
 - c. Date / edition: 2004, John Wiley & Sons, Inc.
 - d. ISBN: 978-0-471-43623-2

Recommended Supporting Text:

 - a. Title: Materials Science and Engineering: An Introduction
 - b. Author: W. D. Callister Jr., D.G. Rethwisch
 - c. Date / edition: 2014, 9th Edition (Wiley)
 - d. ISBN: 978-1-118-32457-8
8. **On the Web:** This course will use CANVAS extensively as a communication and archival tool. The students can access all relevant course information (course notes, homework, problem sets, solutions, announcements, grades, etc.) via the CANVAS entry link: <https://lss.at.ufl.edu/>
9. **Attendance and Expectations:** Attendance is **strongly** suggested since as much as 10% of the grade (for on campus students) comes from attendance, in-class work, and participation. **All electronic devices (phones, etc.) should be turned off or in silent mode. Use of smartphones, laptops, tablets or similar personal computers is not allowed unless explicitly requested by the individual student the first day of class and for note taking purposes only.**
10. **How to Ensure a Response to Your E-mail:** ONLY e-mail me at jnino@mse.ufl.edu. DO NOT USE CANVAS MAIL. Furthermore, because of the volume of e-mails I receive, you

always need to identify yourself and the course. In the subject line you should always include the course number (EMA6313) and your first and last name. Please begin your e-mail with a salutation. [I know that personal e-mails and texts are often sent without even a name to address the recipient at the opening of the communication, but professionally that is unacceptable]. Close your e-mails by typing your name. Check your e-mail for grammar and spelling. Be concise. If I have to sift through what you have written, my response time drops significantly. All of these guidelines are to promote professionalism. If you need help with writing, let me know. We have people on campus that can help you

11. Course Outline: Below is the tentative schedule of meeting sessions.

Date	Topic	Reading/Homework Assignments		Background Reading
		Canvas	Mitchell	Callister
Introduction to Materials Science				
26-Aug	Course Description, Objectives, and Methodology, Background Review	S1	up to page 8	Ch 1-2
Structures of Materials				
28-Aug	Elements, Periodic Table, Types of Bonding, Ionic Bonding	S2	8-19	Ch 2
2-Sep	Covalent Bonding, Metallic Bond, Secondary Bonding, Potential Functions	S3	19-28	Ch 2
4-Sep	Principles of Stereochemistry	S4	Notes	Ch 14
9-Sep	Crystallography: 2D Symmetry, Point Groups, Plane Groups	S5	Notes	
11-Sep	Crystallography: 3D Symmetry, Point Groups, Space Groups	S6	Notes	
16-Sep	Exercises (Set 1): Bonding, Stereochemistry, ... (Prerecorded)	PS1	Notes	
18-Sep	Exercises (Set 2): 2D and 3D Crystallography (Prerecorded)	PS2	Notes	
23-Sep	Crystal Structures, Structure of Metals, Structure of Ceramics	S7	28-44; 55-64	Ch 3; Ch 12
25-Sep	Diffraction, Structure of Glass and Semi-crystalline Systems	S8	44-45;64-71	Ch 3; Ch 12
30-Sep	Structure of Polymers, Classification, Crystallinity, Liquid Crystals	S9	76-99	Ch 14
2-Oct	Structure of Composites, Structure of Biologics	S10	99-128	Ch 16
7-Oct	Exercises (Set 3): Crystal Structures, Diffraction, Polymers, ...	PS3	Notes	
FIRST EXAM (30%; EDGE 33%)				
Thermodynamics of Condensed Phases				
14-Oct	Thermodynamics, Point Defects, Thermodynamics of Point Defects	S11	136-140;45-50;216-219	Ch 4; Ch 12
16-Oct	Line, Planar, and Volume Defects	S11	50-55	Ch 4
21-Oct	Ellingham Diagram, Interfacial Thermodynamics	S12	179-189	Ch 10
23-Oct	Thermodynamics of Composites and Biologics	S13	200-209	
28-Oct	Exercises (Set 4): Point Defects, Defect Equilibria, Ellingham...	PS4	Notes	
Kinetic Processes in Materials				
30-Oct	Phase Transformations	S14	219-224	Ch 9; Ch 10;
4-Nov	Corrosion and Electrochemical Reactions	S15	224-233	Ch 17
6-Nov	Nucleation and Growth	S16	233-241	Ch 10
13-Nov	Kinetics of Polymerization, Kinetic Processes in Biologics	S17	247-263;277-279	
Mechanical Properties of Materials				
18-Nov	Stress-Strain Relationships, Tensors	S18	380-422	Ch 6
20-Nov	Mechanical Properties of Ceramics and Glasses	S19	422-429;434-444;	Ch 12
25-Nov	Creep, Fracture Mechanics and Mechanical Properties of Polymers	S20	429-434;448-472	Ch 8;
2-Dec	Mechanical Properties of Composites and Biologics	S21	472-515;515-532	Ch 15; Ch16
4-Dec	Exercises (Set 5):Kinetics, Mechanical Properties...	PS5	Notes	
SECOND EXAM (40%; EDGE 43%)				
FINAL EXAM (COMPREHENSIVE, 20%; EDGE 24%)				

12. Grading: **Attendance, Group Exercises, and Participation 10% (ON-CAMPUS ONLY).**

There will be a number of short (5-10 minute) exercises (quiz) given out to work out in groups. The exercises will not be graded but handing in a recognizable effort/attempt to solve the problem is required to receive full credit. Attendance will be verified randomly.

Exams (First 30%, EDGE 33%; Second 40%, EDGE 43%). There will be two written exams as indicated in the outline. Although not required to correctly answer the exam, the exams are "open book"; meaning you can consult the course textbook. Prior to the exam you can write anything you want on the textbook. ONLY the hardcover standard edition of the book will be allowed for the exam (not photocopy or related version). No loose pages area allowed. As part of your consultation process during the exam you are not allowed to communicate in any form with other human beings (besides the instructor), or utilize text,

chat or any other internet/wireless form of communication as this will be considered cheating and will result in disciplinary action.

THERE WILL BE A COMPREHENSIVE FINAL EXAM (20%, EDGE 24%). The exam will follow the same guidelines as regular exams and it will take place on Dec 18 from 3-5 pm. Students are responsible for checking for any changes in the schedule and posts on Canvas.

13. Grading Scale: The final grade of the course will be calculated based on the percentage of maximum course score as follows:

Percentage	≥92	≥88	≥84	≥80	≥76	≥72	≥68	≥65	≥62	≥59	≥56	<56
Letter Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Grade Points	4.0	3.67	3.33	3.0	2.67	2.33	2.0	1.67	1.33	1.0	0.67	0

In the event that the class average is below 72%, the distribution will be shifted so that the average equals 72%. In order to graduate, graduate students must have an overall GPA and an upper-division GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

<http://gradschool.ufl.edu/catalog/current-catalog/catalog-general-regulations.html#grades>

14. Make-up Exam Policy: No make-up of the exam will be given. Students who do not attend the exam session at the scheduled time will receive a score of zero points in that exam. Exceptions will be made only in extraordinary circumstances (verified personal emergency, conflict with **previously** scheduled activities, etc.). In such cases an additional exam will be scheduled during the finals week. This exam will be comprehensive and will replace the grade of the missed exam. For EDGE students the exams will be the same dates and will be administered through the EDGE office. EDGE students will typically have a two day window to present the exam.
15. Honesty Policy – All students admitted to UF have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.
16. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.
17. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career or academic goals. The resources include:
- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
 - SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
 - Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.
18. Software Use – All faculty, staff and student 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.