

EMA 3011 Fundamental Principles of Materials
Section 9765
Spring, 2015

1. Catalog Description:

The fundamental principles of structure, reactivity and energies describing materials systems will be covered, directly relating individual principles to specific materials properties or functions. (3 credit hours)

2. Prerequisites and Co-requisites:

The prerequisites for this course are CHM 2046 or CHM 2096.

3. Course Objectives:

In this course the student is introduced to the way in which the fundamentals of organic materials and the physical laws of quantum mechanics influence materials properties and reactions. The specific objectives are to:

- Become familiar with the fundamentals of organic chemistry and be able to apply them to the chemical and physical properties and processing of polymer materials
- Learn the laws of quantum mechanics and understand the way in which they influence materials properties

4. Contribution of course to meeting the professional component:

This course provides 3 credits towards Engineering Sciences.

5. Relationship of course to program outcomes:

This course addresses the following MSE Program outcome:

- Ability to apply knowledge of mathematics, science, and engineering to materials systems (High coverage). Students demonstrate this knowledge on homework problems and exams.

6. Instructor:

Prof. Susan B. Sinnott

- Office: 164 RHN
- Telephone: 352-846-3778 (office)
- E-mail address: ssinn@mse.ufl.edu
- Web site: sinnott.mse.ufl.edu
- Office hours: W 1:00-2:00, Th 12:30-1:30, on drop-in basis, and by appointment

7. Teaching Assistant:

Mr. Michael Ashton

- Office: RHN 100C
- Telephone: (719) 930-9875
- E-mail address: mashton@ufl.edu
- Office hours: MT 1:30-2:30

8. Meeting Times:

Monday, Wednesday, Friday 4th period

9. Meeting Location:

2328 TUR

10. Textbooks Required:

- Title: Introduction to Organic Chemistry
Authors: William Brown and Thomas Poon
Publisher: Wiley
Publication date and edition: 2011, 4th
ISBN number: 978-0-470-12923-4
- Title: Elements of Physical Chemistry
Author: Peter Atkins and Julio de Paula
Publisher: Freeman
Publication date and edition: 2009, 5th
ISBN number: 1-4292-1813-4

11. Attendance and Expectations:

Attendance in class is not mandatory but is strongly encouraged. The material covered and for which students are responsible will follow the books closely in some areas and will deviate from them in others.

12. Grading:

Uploaded photo to e-Learning site	4%
Quizzes	8%
Exam #1	22%
Exam #2	22%
Exam #3	22%
Exam #4	22%

13. Grading Scale:

92-100 = A; 91-88 = A-; 87-84 = B+; 83-80 = B; 79-76 = B-; 75-72 = C+; 71-68 = C; 67-65 = C-; 64-62 = D+; 61-59 = D; 58-56 = D-; Less than 56 = E. Grades may be curved up at the end of the course at the discretion of the instructor.

14. Make-up Exam Policy:

Makeup exams will not be given without an excused absence supported by written documentation.

15. Assignments:

- An uploaded, clear, head and shoulders photo to the e-Learning site by the stated deadline.
- Homework problems are given in the course outline below and solutions will be posted to the e-Learning site. Homework is not graded.

- Quizzes will be posted to the e-Learning site and will be due on the days indicated in the course outline. They will be similar in scope and tone to the homework problems. The lowest quiz grade will be dropped at the end of the semester.
- Exams will closely follow the material covered in class and will be closed book; however, students may bring one 3"x5" index card of material (front and back, hand-written or printed electronically) for use on the exam (index cards must be turned in with exams.) Some of the questions on the exams will be taken directly from relevant homework sets. No cell phones or programmable calculators may be used or be with students during exams. Use of these items will be considered to be violation of exam rules and will result in an E on the exam. Requests for re-grading must be made within one week after an assignment has been returned if the exam is taken in ink. If pencils are used on the exams, no regarding requests will be considered.

16. Honesty Policy:

All students admitted to the University of Florida 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.

17. 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.

18. UF Counseling Services:

Resources are available on-campus for students having personal problems or lacking clear career and 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.

19. 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.

20. Course Outline:

Class #	Class Date	Topic	Relevant Information or Reading Assignment	Homework Problems
1	W, 1/7	Welcome and introduction		
2	F, 1/9	Why quantum mechanics?	A&deP: 12.1-12.4 + sup info	12.1; 12.8; 12.11; 12.16; 12.20
3	M, 1/12	Laws of quantum mechanics	A&deP: 12.5-12.6	12.21; 12.24; 12.25; 12.26
4	W, 1/14	Motion of a quantum particle	A&deP: sup info + 12.7	12.28; 12.29; 12.30
5	F, 1/16	Confinement of a quantum particle	A&deP: sup info + 12.7	12.32; 12.33; 12.34
	M, 1/19	UF Holiday – No class		
6	W, 1/21	Rotational motion of a quantum particle	A&deP: 12.8	12.35; 12.36; 12.37 Quiz #1 due
7	F, 1/24	Vibrational motion of a quantum particle	A&deP: 12.9	12.40; 12.41
8	M, 1/26	Hydrogenic atoms (notes on-line, Sinnott on travel, no class)	A&deP: 13.1-13.3	13.1; 13.4; 13.6
9	W, 1/28	Wavefunctions of orbitals (notes on-line, Q&A with TA in class, Sinnott on travel)	A&deP: 13.4-13.7	13.10; 13.11
10	F, 1/30	Many-electron atoms	A&deP: 13.8-13.10	13.14; 13.16
11	M, 2/2	Many-electron atoms	A&deP: 13.11-13.14	13.20; 13.22; 13.29 Quiz #2 due
12	W, 2/4	Molecular orbitals Review for Exam 1	A&deP: 14.7, 14.8 5:00-6:00 PM, 125 RHN	14.10
13	F, 2/6	Exam 1		
14	M, 2/9	Diatomic molecules	A&deP: 14.9-14.11	14.15; 14.16
15	W, 2/11	Diatomic molecules	A&deP: 14.12-14.14	14.23; 14.26; 14.27; 14.34
16	F, 2/13	Polyatomic molecules and materials	A&deP: 14.15 + sup info	14.32; 14.33; 14.35
17	M, 2/16	Why organic chemistry? Structure and bonding in organic molecules	B&P: 1.4-1.7	1.35; 1.37; 1.39; 1.44 (b), (d), (f), (h); 1.50 (b), (c); 1.51 (b), (d), (f)
18	W, 2/18	Alkanes and cycloalkanes	B&P: 3.1-3.5	3.13 (b), (d), (f); 3.14 (a), (b), (c)
19	F, 2/20	Alkanes and cycloalkanes (notes on-line, Sinnott on travel, no class)	B&P: 3.6, 3.7, 3.9	3.17; 3.19; 3.24 (b), (d), (f); 3.25 (b), (d), (f); 3.36 (a), (b); 3.46; 3.55 (b), (c)
20	M, 2/23	Chirality	B&P: 6.1-6.4	6.15; 6.19 (b), (d), (f); 6.22; 6.24 (a), (b); 6.25 (b), (d); 6.36 (a), (b), (c)
21	W, 2/25	Alkenes and alkynes	B&P: 4.1, 4.2, 5.2, 5.3	4.15 (b), (d), (f), (h); 4.17 (b), (d); 4.18 (a), (c), (e); 4.21; 4.23; 4.27 (a), (b); 4.28 Quiz #3 due
22	F, 2/27	Reactions of alkenes and alkynes	B&P: 5.4-5.6	5.21; 5.25; 5.30; 5.31
	M, 3/2	Spring Break – No class		
	W, 3/4	Spring Break – No class		
	F, 3/6	Spring Break – No class		
23	M, 3/9	Reactions of alkenes and alkynes	B&P: 5.7, 5.9-5.11	5.41; 5.43; 5.49 (b), (d); 5.52; 5.57 (b), (d), (f), (h)

24	W, 3/11	Haloalkanes Review for Exam 2	B&P: 7.1-7.3 5:00-6:00 PM, 125 RHN	7.9; 7.11; 7.17; 7.19
25	F, 3/13	Exam 2		
26	M, 3/16	Haloalkanes (notes on-line, Sinnott on travel, no class)	B&P: 7.4-7.6	7.21; 7.22; 7.24; 7.28; 7.31; 7.33
27	W, 3/18	Haloalkanes	B&P: 7.7-7.9	7.34; 7.40; 7.42
28	F, 3/20	Alcohols, ethers, and thiols	B&P: 8.1-8.3	8.13 (b), (d), (f); 8.15 (b), (d), (f), (j); 8.25 (b), (d); 8.30; 8.34; 8.35
29	M, 3/23	Alcohols, ethers, and thiols	B&P: 8.4-8.6	8.38 (b), (d), (f); 8.41 (b), (d); 8.46; 8.49 Quiz #4 due
30	W, 3/25	Benzene and its derivatives	B&P: 9.1-9.4	9.11 (b), (d), (f); 9.13 (b), (d), (f); 9.14 (b), (d), (f), (h), (j), (l), (n), (p)
31	F, 3/27	Benzene and its derivatives	B&P: 9.5-9.8	9.26; 9.31 (b), (d); 9.38 (b), (d); 9.42; 9.48
32	M, 3/30	Amines and their derivatives	B&P: 10.1, 10.2, 10.4	10.11 (a), (b), (d), (f), (j), (k); 10.22 (b), (d); 10.29; 10.33
33	W, 4/1	Amines and their derivatives Review for Exam 3	B&P: 10.5-10.8 5:00-6:00 PM, 125 RHN	10.44
34	F, 4/4	Exam 3		
35	M, 4/6	Aldehydes and ketones	B&P: 13.1, 13.2, 13.4, 13.5	13.15; 13.17 (b), (d), (f); 13.18 (b), (d), (f); 13.20; 13.21
36	W, 4/8	Aldehydes and ketones	B&P: 13.6-13.9	13.23; 13.29; 13.30; 13.36; 13.38; 13.40; 13.46 Quiz #5 due
37	F, 4/10	Carboxylic acids (notes on-line, Q&A with TA in class, Sinnott on travel)	B&P: 14.1, 14.2, 14.4	14.9 (b), (d), (f); 14.10 (b), (d), (f); 14.18; 14.21; 14.23 (b), (d)
38	M, 4/13	Carboxylic acids	B&P: 14.5-14.8	14.30; 14.31; 14.39 (b), (d); 14.47
39	W, 4/15	Functional derivatives of carboxylic acids	B&P: 15.1-15.4	15.9; 15.10 (a), (d), (f), (i); 15.20
40	F, 4/17	Functional derivatives of carboxylic acids Review for Exam 4	B&P: 15.5-15.8 5:30-6:30 PM, 125 RHN	15.26; 15.33; 15.46
41	M, 4/20	Exam 4		
42	W, 4/22	Class wrap-up, instructor evaluations, preview of junior year MSE classes		