EMA 3066 (Section 2836)

INTRODUCTION TO ORGANIC MATERIALS (POLYMERS)

Syllabus for Fall Semester 2015

1. **Catalog Description** - Uses, structure, processing and properties of organic materials, including polymers, biomacromolecules and small molecule organic materials. Scientific principles are introduced through discussion of developed organic materials for high technology applications. (3 credit hours).

2. **Pre-requisites** - EMA 3010 and one of the following: EMA 3011, CHM 2200 or CHM 2210.

3. **Course Objectives** - This is an introductory course in organic materials, with emphasis on polymer science and engineering. The topics to be covered will be broken down into three categories- (1) synthesis and processing of polymers, (2) polymer structure and characteristics, and (3) properties and applications of polymers and advanced organic materials. The specific objectives for the course are:
   a. To be able to choose the appropriate synthetic and processing strategy for preparing common polymers
   b. To be able to predict the properties of polymers and advanced molecular materials based on knowledge of structure and morphology.
   c. To be able to choose an appropriate polymer based on the properties needed for a particular application.

4. **Contribution of course to meeting the professional component** - This is a 3 credit course. It provides 2 credits towards engineering sciences and 1 credit towards design.

5. **Relationship of course to program outcomes** - This course addresses the following MSE Program outcomes (note: letters refer to the list of MSE Program Educational outcomes):

   a. Ability to apply knowledge of mathematics, science, and engineering to materials systems

   c. Ability to apply and integrate knowledge of structure, properties, processing, and performance to solve materials selection and design problems within realistic constraints.

   g. Ability to communicate effectively in both oral and written form.

   h1. Understanding of the economic impact of engineering solutions.

   k. Ability to use the techniques, skills, and tools needed for practice as a materials engineer

6. **Instructor**: Laurie B. Gower, Professor of Materials Science & Engineering
   a. Office Location: 210A Rhines Hall (ring doorbell to be heard in inner office)
   b. Office phone: 846-3336
   c. E-mail: lgower@mse.ufl.edu
   d. Class Website on https://lss.at.ufl.edu/ (Canvas login with student ID)

e. Office Hours for Gower: TBD

7. Teaching Assistant: Shanna Smith

a. Office location:
b. Telephone:
c. E-mail:
d. Office Hours for TA: TBD

8. Class Meeting Times: MWF 10:40- 11:30am

9. Class schedule: MWF 4th period

10. Class Meeting Location: Florida gym 270

11. Material and Supply Fees: NA

12. Textbook required:

a. Title: Essentials of Polymer Science and Engineering
b. Authors: Paul C. Painter & Michael M. Coleman
c. Publication Date and edition: 2009, 1st edition (DEStech Publications Inc)
d. ISBN: 978-1-932078-75-6
e. (the prior book by these authors Fundamentals of Polymer Science is acceptable)

13. Recommended reading: NA

14. Course Outline:

Tentative Schedule (8-24-15) *Exam dates are not yet confirmed

Week of:	Topic #	Reading Assign.
Aug. 24	1. Course Overview	Chapter 1
	2. Types of Polymers	Chapter 2
	3. Isomerism	
Aug. 31	4. Molecular Weight Distributions	
	5. Polymer Synthesis: Step-Growth (Condensation) Polym.	Chapter 3-5 (parts)
	6. Chain-Growth (Addition) Polymerization:	
Sept. 7	***Labor Day Holiday***	
	7. Coordination/Insertion Polymerizations and Catalysts	
	8. Ionic Polymerizations	
Sept. 14	9. Network Polymerizations	
	10. Polymerization Practice	
	11. Copolymerization	Chapter 6 (parts)
Sept. 21	Cont.	
	12. Bonding	Chapter 8
	13. Chain Conformation & Dimensions	
Sept. 28	14. Polymer Morphology	
	15. Polarized light microscopy	website
	Review for Exam 1	
Oct. 5	**Exam 1: Monday, Oct. 5th evening (no morning class)**	**thru Topic 11**
	16. Properties of Semicrystalline Polymers	Chapter 10
	17. Glass transition	
Oct. 12	18. Thermodynamics of crystallization	
	19. Kinetics of crystallization	
	Cont.	
Oct. 19	20. Factors effecting Crystallinity and Tm	
	21. Factors effecting Tg	
	22. Liquid Crystalline Molecules and Polymers	Notes

Oct. 26	23. Polymer Solubility	Chapter 11
	24. Polymer Phase Diagrams	
	Review session	
Nov. 2	**Exam 2: Monday November 2nd evening (no morning class)**	Thru Topic 22
	25. Flory-Huggins Theory	
	Fri. 6th: Homecoming Holiday	
Nov. 9	*26.* Mechanical Properties of Polymers	Chapter 13
	Wed. 11th: Veterans Day Holiday	
	27. Rubber Elasticity	
Nov. 16	28. Cont.	
	29. Rheology of Polymer Melts	
	30. Viscoelasticity	
Nov. 23	31. Dynamic Mechanical Thermal Analysis (DMTA)	
	Wed. 25th: Thanksgiving Holiday	
	Fri. 27th: Thanksgiving Holiday	
Nov. 30	32. Materials Selection & Design	Substitute notes
	33. Materials Cost Analysis	Substitute notes
	TBD	Substitute notes
Dec. 7	**Exam 3: Monday December 7th (no morning class)**	Thru topic 31
	34. Time-Temperature Superposition (TTS)	
	Reading days	
TBD	Optional review session for Final	
Dec. 18	**FINAL EXAM (18B: Friday 10:00 am - 12:00 pm)**	Cumulative

15. Attendance and Expectations:

- **Homework**: Homework should be turned in at the beginning of class. No late submissions will be accepted in order that solutions can be posted after class.
- **Grade changes:** Requests for adjustment to any grade should occur within the 2 week period following the posted grade in question, and must be approved by the course instructor (you can discuss your concerns with the TA, but the TA cannot change grades without final approval from the instructor).
- **Policy on Class Attendance**: Lecture attendance is recommended. While attendance is not mandatory, experience has shown that those who attend lectures earn higher grades in the course. It is also highly recommended that you either buy or print out the lecture notes prior to class because they are a template for adding further information and note taking during class.
- **Policy on Cell Phones:** Cell phones should be turned off or on vibrate mode during class, with the exception of a primary care giver. If/when receiving a call, promptly move to outside the classroom.
- **Make-up Exam Policy**- Make-up exams will be provided only with the ***prior approval of the instructor or excused absence.*** In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, religious holidays and participation in official university activities such as music performances, athletic competition or debate.

16. Grading: Homework- 10% (no drops)
First exam- 20%
Second exam- 20%
Third exam- 20%
Final exam- 30% (comprehensive)

***** Homework and grades will be posted on the class Sakai website, approximately weekly

17. Grading Scale: Final grades will be assigned according to the following scale:

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

"A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

18. **Requirements** for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

19. **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 (http://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.

Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures. See http://www.dso.ufl.edu/sccr/procedures/honorcode.php

20. **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.

21. **UF Counseling Services** –Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
    - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, http://www.counseling.ufl.edu/cwc/Default.aspx, counseling services and mental health services.
    - Career Resource Center, Reitz Union, 392-1601, career and job search services.

22. **University Police Department** 392-1111

23. **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.

24. **Students are expected to provide feedback** on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. 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.