

Polymer Physical Science

EMA6165, Sections 39GD

Class Periods: Tue (Period 3) 9:35 – 10:25 AM, Tue/Thur (Periods 2 & 3) 8:30 – 10:25 AM

Location: 125 Rhines Hall

Academic Term: SPRING 2019

Instructor:

Anthony B. Brennan, PhD

abrennan@mse.ufl.edu

352-392-6281 (O) 352-219-8165 (C)

Office Hours: Tue: Period 4 & Thu: Period 4, 135 Rhines Hall

Teaching Assistants:

- NA

Course Description

Solid state properties of amorphous and semi-crystalline polymers.

Course Pre-Requisites / Co-Requisites

EMA 3066

Course Objectives

- Students will be able to:
 - Apply first order thermodynamics to describe molecular dimensions of polymers/plastics
 - Correlate physical and mechanical properties with thermodynamic properties of polymers/plastics
 - Correlate morphology with physical, mechanical and thermal properties of polymers/plastics
 - Correlate rubber elastic behavior with molecular structure, composition and network structure of polymers/plastics
 - Conduct experiments to observe the physical, mechanical and thermal properties of polymers

Materials and Supply Fees

NA

Required Textbooks and Software

- Title: Introduction to Physical Polymer Science
- Author: L.H. Sperling
- Publisher: John Wiley & Sons
- Published: 2006, 4th Edition
- ISBN: 978-0471706069
- Lecture notes/slides provided on:
 - Website: Canvas: EMA 4161/EMA4161L { <https://ufl.instructure.com/courses/339208> }

Recommended Materials

- Additional materials provided on Website: Canvas: EMA 4161/EMA4161L
- Other materials: <https://ufl.instructure.com/courses/339208>
 - [Previous exams](#)
 - [Guide to Thermal Properties of Polymers](#)
 - [Equations Used in Polymer Physics](#)

Course Schedule

See attachment to this Syllabus

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is required to complete the lab assignments. Arrival on time is expected. Please turn off all cell phones upon entering class. Reading of newspapers, work on assignments for this or other classes, or other activities that are not part of the class are not allowed. Students who do not comply with these requirements or who behave disorderly or disrespectfully may be asked to leave the classroom. Make up labs will be provided only with the **approval of the instructor in accordance with university policies.** Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. In general, acceptable reasons for excused absence include illness, serious family emergencies, special curricular requirements, military obligation, court-imposed legal obligations, and religious holidays. In all cases, you will be required to provide written documentation, and obtain instructor approval. You will not be excused from any lab without following the policy above, with no exceptions. Students not in attendance for the scheduled lab will receive a score of zero.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (10)	10 each	10%
Quizzes (4)	25 each	10%
Exam 1	100	20%
Exam 2	100	20%
Exam 3	100	20%
Project*	100	20%
		100%

*Refer to Proposal Outline Attachment

Grading Policy

Percent	Grade	Grade Points
93.1 - 100	A	4.00
89.8 - 93.0	A-	3.67
86.5 - 89.7	B+	3.33
83.2 - 86.4	B	3.00
79.9 - 83.1	B-	2.67
76.6 - 79.8	C+	2.33
73.3 - 76.5	C	2.00
70.0 - 73.2	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.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@ufl.edu

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

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 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.
<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.

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

EMA6165, Sections 2E52
Polymer Physical Science
Tue (T) Period 3 (9:35 – 10:25 AM) E122 CISE
Tue (T) Period 4 (10:40 – 11:30 AM) E122 CISE
Thu (R) Period 4 (9:35 – 10:25 AM) E122 CISE
3 CREDITS

Instructor: Dr. A.B. Brennan
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Telephone: 352.392.6281 (o)
 352.219.8165 (m)
Email: abrennan@mse.ufl.edu
Office hours: Tue Period 3 Thur Period 4: and By Appointments
Website: brennan.mse.ufl.edu

HONOR CODE: We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.

COMPREHENSIVE FINAL EXAM

Thursday, May 2, 2019

8:30 AM to 10:30 AM

Group 2A*

This schedule is meant to identify the materials and times for the semester. However, there will be variations due to unforeseen circumstances. The actual lectures will be given at other times if the schedule is changed. The materials covered may vary depending upon student needs and abilities.

"Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation."

No.	Date	Day	Topic	Assignment
1	1/8/19	Tue	Introduction	Read Chapter 1 Hmwk 1: #1.2, #1.5, #1.8, #1.9
2	1/10/19	Thu	Fundamentals, Nomenclature, cont'd	
3	1/10/19	Thu	Condensation and Addition Polymerizations, Polymers	Read Chapter 2: Hmwk 2: #2.1, #2.2, #2.4, #2.7
4	1/15/19	Tue	Chain configuration, conformations (Make-up for 8/29/17)	Hmwk 1: DUE
5	1/17/19	Thu	Dilute solution Thermodynamics - Entropy	Read Chapter 3, Hmwk 3: #3.1, #3.2, #3.4, #3.7
6	1/17/19	Thu	Chain Statistics - Random Flight Gel Permeation Chromatography	QUIZ 1:

7	1/22/19	Tue	<i>Gel Permeation Chromatography</i>	Hmwk 2: DUE
8	1/24/19	Thu	Polymer-polymer miscibility (Make-up for 8/29/17)	Read Chapter 4: Hmwk 4: #4.1, #4.2, #4.4, #4.7
9	1/24/19	Thu	P(S-b-BD-S) Morphology	
10	1/29/19	Tue	Polymer-polymer miscibility (Make-up for 8/29/17)	Hmwk 3: DUE
11	1/31/19	Thu	Polymer-polymer miscibility (Make-up for 8/29/17)	
12	1/31/19	Thu	Amorphous State – Experimental Methods	QUIZ 2: Read Chapter 5 Hmwk 5: 5.2, 5.5, 5.7 and 5.9
13	2/5/19	Tue	<i>Amorphous State-Chain dimensions</i>	Hmwk 4: Due (Assignment 4)
14	2/7/19	Thu	Amorphous State-Reptation	
15	2/7/19	Thu	Crystalline Structure – Lattices, T_m	Read Chapter 6 Hmwk 6: #6.5, #6.7, #6.10, #6.16
16	2/12/19	Tue	<i>Morphology of Crystalline polymers</i>	Hmwk 5 DUE:
17	2/14/19	Thu	EXAM 1	
18	2/14/19	Thu	EXAM 1	
19	2/19/19	Tue	Crystallization Kinetics	
20	2/21/19	Thu	Characterization of T_m , T_c	
21	2/21/19	Thu	Liquid Crystalline Polymers	Read Chapter 7 Hmwk 7: #1, #3
22	2/26/19	Tue	Glass-Rubber Transitions	Read Ch 8 Hmwk 8: #8.3, #8.7, #8.12, #8.13: Hmwk 6 DUE
23	2/28/19	Thu	Characterization of Thermal Transitions in polymers	
24	2/28/19	Thu	<i>Glass Transition theory</i>	Hmwk 7 DUE
	3/5/19	Tue	SPRING BREAK	
	3/7/19	Thu	SPRING BREAK	
	3/7/19	Thu	SPRING BREAK	
25	3/12/19	Tue	Glass Transition Theory – cont'd	
26	3/14/19	Thu	(Make-up for 10/17/17) Glass Transition Theory – cont'd	Hmwk 8 DUE
27	3/14/19	Thu	Time Temperature Transformation, transitions in gels, ROM	Quiz 3:
28	3/19/19	Tue	<i>T_g for Miscible and non-Miscible Systems</i>	
29	3/21/19	Thu	T_g and T_m influence, Pressure effects	Submit: Research Proposal Topic (Canvas) by 11:59 PM
30	3/21/19	Thu	EXAM 2	
31	3/26/19	Tue	EXAM 2	

32	3/28/19	Thu	Rubber Elasticity	Read Ch 9, Hmwk 9: Exercises 9.2, 9.4, 9.10, 9.13, 9.18
33	3/28/19	Thu	(Make-up for 10/17/17) Rubber Elasticity	
34	4/2/19	Tue	Rubber Elasticity	
35	4/4/19	Thu	Rubber Elasticity - Statistical Thermodynamics	
36	4/4/19	Thu	Rubber Elasticity – Gels cont'd	Submit: Research Paper Outline (Canvas) by 11:59 PM
37	4/9/19	Tue	Rubber Elasticity - Gels	Hmwk 9 DUE
38	4/11/19	Thu	Viscoelasticity	
39	4/11/19	Thu	Viscoelasticity – cont'd	Read Ch. 10, Hmwk 10: 10.2, 10.3, 10.9, 10.16
40	4/16/19	Tue	Viscoelasticity – cont'd	
41	4/18/19	Thu	Viscoelasticity – cont'd	QUIZ 4
42	4/18/19	Thu	Mechanical Behavior	Read Ch 11
43	4/23/19	Tue	Mechanical Behavior - cont'd	Hmwk 10 DUE, SUBMIT RESEARCH PAPER
	5/2/19	Tue	Exam 3: FINAL EXAM – GROUP 2A 8:30 AM to 10:30 AM	NOTE THAT THIS IS SCHEDULED LATER BY ONE HOUR

NOTE: This schedule will serve as a guide to the subjects and approximate order in which they will be presented. However, in view of the interests of the class and available information subjects may be omitted and/or replaced. The dates are based upon the current academic calendar and will be adhered to as closely as possible. Every attempt will be made to re-schedule any lectures, which may be cancelled during this semester.