Polymer Chemistry
CHEM 466
Spring 2014
Texas A&M University, College Station, TX, USA

If it is necessary to change any content of this syllabus, students will be informed as soon as possible.

Meeting Times:

Tuesdays and Thursdays, 11:10 a.m. – 12:25 p.m.; January 14 – April 24, 2014

Meeting Location:

CHEM 2104

Instructor:

Karen L. Wooley, Ph.D., W. T. Doherty-Welch Chair in Chemistry & Professor in Chemical Engineering, University Distinguished Professor
Office: Chemistry Complex, Rm. 1422
Tel.: (979) 845-4077
e-mail: wooley@chem.tamu.edu
website: http://www.chem.tamu.edu/faculty/wooley

Office Hours:

Mondays and Wednesdays, 3:00 – 4:00 p.m.
Weekly, January 20 – April 23, 2014

Logistical items may be addressed *via* telephone or email communication, but for complex matters of understanding course material, please visit my office hours. Deviations from this schedule will be announced during lecture.

Course Website Address:

http://chem.tamu.edu/rgroup/wooley/chem466

Course Catalog Title and Description:

Polymer Chemistry. Credit 3. Mechanisms of polymerization reactions of monomers and molecular weight distributions of products; principles, limitations and advantages of most important methods of molecular weight determination; relationship of physical properties to structure and composition; correlations of applications with chemical constitution.

Prerequisites:

CHEM 228 and CHEM 315, or equivalents

Textbook:

Hiemenz, P. C.; Lodge, T. P. *Polymer Chemistry*, 2nd Edition; CRC Press, Taylor & Francis Group: Boca Raton, FL, USA, 2007

In addition, we will cover topics from the current literature, with appropriate literature articles being provided.

Grading Policy:

Grade assignments for the course will be based upon performance on:

1) Quizzes, 10 x 10 pts
2) Examinations, 3 x 100 pts
3) Final Examination, 100 pts

At the end of the semester, one category or item that totals 100 points possible (total of the quizzes, one exam, or the final exam) will be dropped from the grade calculation. Therefore, the total possible point total will be 400 points, making the total of the quizzes and each exam worth 25% of the final grade.

Exams and Quizzes:

There will be ten in-class quizzes, which will be given throughout the semester on unannounced dates. Each will require *ca*. 5 - 10 min to complete.

There will be three in-class examinations, which will occupy the full 1 h 15 min class period, on the dates of February 6, March 6, and April 10, 2014. Each will emphasize course material covered during the interim since the previous examination, but the course material will build over the semester, so that each examination will involve concepts discussed throughout the semester.

The final examination will be held on Friday, May 2, 2014 at 3:00 - 5:00 p.m.

Learning Outcomes:

Polymer materials are components of many common and sophisticated products and devices that are encountered on a daily basis. The breadth of applications for polymers is derived from the vast array of compositions and structures that lead to diverse properties. It is expected that by the end of Chem 466, students will have gained significant fundamental knowledge of polymer chemistry, as illustrated by the following capabilities.

- Describe polymer structural features
- Illustrate various polymerization chemistries
- Provide polymer structures, given reagents and conditions
- Draw reaction mechanisms for polymerization strategies
- Apply polymer modification chemistries
- Apply concepts of polymer chemistry to the construction of complex polymer materials
- Analyze physical, chemical and mechanical properties data
- Evaluate common products to recognize polymer components and identify their purpose(s) and performance criteria
- Formulate structure-property relationships, *i.e.*, relate the compositions and structures of polymers to expected physical, chemical and mechanical properties, and in the reverse, be able to transform purposes and performance criteria for polymer applications into chemical compositions and structures that could exhibit the appropriate properties
- Construct retrosynthetic analyses for novel polymer structures
- Design polymer structures based upon desired properties and applications

Tentative Calendar and Topics:

This schedule is subject to change—adjustments may be made, as needed.

Date/Lecture #	Text Chapter*	Topic
14 January (Tu)/1	1	General introduction to polymers
16 (Th)/2	1, 2, 3	Overview of polymerization mechanisms
21 (Tu)/3	2	Step-growth/condensation polymerizations
23 (Th)/4	2	Step-growth/condensation polymerizations
28 (Tu)/5	2	Step-growth/condensation polymerizations
30 (Th)/6	2, 4	Macromolecular architectural control *via* step-growth polymerizations
4 February (Tu)/7	2, 4	Macromolecular architectural control *via* step-growth polymerizations
6 February (Th)	**EXAMINATION I**	
11 (Tu)/8	2, 4	Macromolecular architectural control *via* step-growth polymerizations
13 (Th)/9	1, 8-13	Polymer characterization, in brief—molecular weight, viscosity, thermal analysis, mechanical properties
18 (Tu)/10	1, 8-13	Polymer characterization, in brief—molecular weight, viscosity, thermal analysis, mechanical properties
20 (Th)/11	Literature	Chain-growth polycondensations
25 (Tu)/12	3, 4	Chain-growth polymerizations
27 (Th)/13	3, 4	Chain-growth polymerizations—anionic and cationic
4 March (Tu)/14	3, 4	Chain-growth polymerizations—anionic and cationic
6 March (Th)	**EXAMINATION II**	
10	**SPRING BREAK**	
13		
18 (Tu)/15	3, 4	Chain-growth polymerizations—radical
20 (Th)/16	5	Chain-growth polymerizations—controlled radical
25 (Tu)/17	5	Chain-growth copolymerizations—(controlled) radical copolymerizations
27 (Th)/18	4, 5	Chain-growth polymerizations—radical ring-closing and ring-opening
1 April (Tu)/19	4	Chain-growth polymerizations—ring-opening
3 (Th)/20	4, 5	Macromolecular architectural control *via* chain-growth polymerizations
8 (Tu)/21	4, 5	Macromolecular architectural control *via* chain-growth polymerizations
10 April (Th)	**EXAMINATION III**	
15 (Tu)/22	5	Transition metal-mediated polymerizations and stereoregularity
17 (Th)/23	Literature	Special topic in polymer chemistry, TBD
22 (Tu)/24	Literature	Special topic in polymer chemistry, TBD
24 (Th)/25	Literature	Special topic in polymer chemistry, TBD
2 May (Fri)	**FINAL EXAMINATION, 3:00 – 5:00 p.m.**	

*Literature articles will supplement the textbook chapter contents.

Americans with Disabilities Act (ADA) Policy Statement:
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