ChE/MSE 5350: Polymer Science, Fall 2016
Department of Chemical Engineering and Materials Science
Wayne State University

Lecture: 4:30pm – 5:50pm T Th, 0151 Main

Instructor: Dr. Haipeng Liu,
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Web Site: http://www.blackboard.wayne.edu

Office Hours: Thursday 12:00-1:00pm or Send me email to make an appointment, we’ll work something out.


Reference books: “Principles of Polymerization” George Odian
“Introduction to polymers” Robert J. Young
“Polymer Chemistry” by Malcolm P. Stevens (3rd Edition) (an entry level book)

Learning Objectives:
In this course, students will:
1. Familiar with basic properties of polymer
2. Calculate the density of a cross-linked polymer from the polymer-solvent interaction parameter and the solubility parameters.
3. Distinguish between the melting and glass transition temperature of a polymer.
4. Compute the degree of polymerization conversion based on different kinetics of stepwise and chain polymerizations.
5. Describe the differences among bulk, solution, dispersion, and emulsion polymerizations.
6. Calculate and understand the importance of number-average and weight-average molecular weights.
7. Apply gel permeation chromatography and light scattering methods to determine the molecular weight averages.
8. Explain viscoelasticity using the Maxwell model.

Grading:
Homework: 5%
Class participation and quizzes: 5%
Assigned literature reading and problems: 10%
Midterm Exam: 30%
Final Exam (comprehensive): 50%

Extra Credit: No extra credit will be allowed.
Grading Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>100-85%</td>
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<tr>
<td>B</td>
<td>84-70%</td>
</tr>
<tr>
<td>C</td>
<td>69-55%</td>
</tr>
<tr>
<td>D</td>
<td>54-35%</td>
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Homework

Assigned on Thursdays, due in one week. Homework sets are expected to be neat. You must turn them in before the due date to receive full credit.

Quizzes and Exams

Quizzes and exams are closed book. No textbook or notes are allowed. Quizzes based on the current homework assignment will be given at scheduled times throughout the semester and have varying contributions to the “class participation score.” Only simple calculators without any programming/wifi connection can be used. No internet access will be permitted during exam period. The instructor may provide necessary formula to accompany the exam paper. Most questions on the exams will cover materials similar to homework and examples, but each exam will have at least one question that goes beyond the homework and examples.

Add/Drop

Students may request a withdrawal from the course via Pipeline. However, students are strongly discouraged from withdrawing from the course due to their academic performance. Students failing the course at the time of withdrawal will be given a mark of “WF”.

Missed Exams

Students who must miss an exam for any reason are expected to contact the course instructor before the date of the exam. Valid excuses for missing an exam are: illness, car crash, death in the immediate family, and jury duty. Students must provide documentation (doctor’s note, police report, death certificate, etc), before make-up examinations will be administered.

Attendance

Lecture attendance is not mandatory but the student is responsible for ALL material covered in class. Students are encouraged to attend all classes. No make-up quizzes will be given to students who do not attend the class in which they were given. Poor weather conditions are not valid excuses for missing class if the university is open.

Academic Ethics

Students are expected to do their own work in this course. Severe penalties are applied in cases of academic dishonesty. You may certainly consult with other students for help on homework assignments and projects; however, the work that you submit for grading must be your own. Examples of academic dishonesty and penalties can be found in Table 1.

Table 1: Examples of academic dishonesty and penalties.

<table>
<thead>
<tr>
<th>Academic Dishonesty</th>
<th>Penalty</th>
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<tbody>
<tr>
<td>Copying homework from solution manual</td>
<td>Semester homework grade of 0.</td>
</tr>
<tr>
<td>Copying homework from a classmate</td>
<td>Score of 0 on that assignment.</td>
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<tr>
<td>Use of notes on closed book exams</td>
<td>Failing grade for course.</td>
</tr>
<tr>
<td>Use of cell phones or other electronic communications during exams.</td>
<td>Failing grade for course.</td>
</tr>
<tr>
<td>Copying from another student during exam.</td>
<td>Failing grade for course.</td>
</tr>
<tr>
<td>Copying text from the Internet, or books, into project report.</td>
<td>30% reduction in project grade.</td>
</tr>
<tr>
<td>Copying text or calculations from another project report.</td>
<td>Score of 0 for project.</td>
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Lecture Schedule:

09/01,09/06  Introduction, structure, and solubility  Chapter 1,2
09/8,13   Physical states: glass and melting transitions  Chapter 3
09/15,20  Formation: reaction kinetics  Chapter 4
09/22,27  Formation: reaction processes  Chapter 5
09/29,10/04,  Size: molecular weight (Quiz #1 on 09/29)  Chapter 6

10/06  No class

10/11  Intrinsic viscosity and viscosity measurements  Chapter 7
10/13  Mid-term exam  Ch.1-6
10/18,20  Viscosity and elasticity  Chapter 7,8
10/25,27  Viscoelasticity and mechanical failure (Quiz #2 on 10/27)  Chapter 8,9
11/01,03  Characterization methods  Chapter 17
11/08,10  Special topics  Notes
11/15,17  Literature research week (no class)
11/22  Special topics  Notes
11/24,  Thanksgiving break (no class)
11/29,12/01  Special topics (Quiz #3 on 11/29)  Notes
12/06, 08  Course review and previous final exam
12/13  No class (Study day)
12/15  Final exam  All chapters