MSE 151 Polymeric Materials

Class will meet on Monday and Wednesday from 9:30-11:00 am

Location: 348 HMMB

Instructor: Ting Xu (381 HMMB)

TA: Zhiyuan Ruan

Office Hour (Instructor): Monday 2:00-3:00 pm at 381 HMMB

Office Hour (TA): Friday 1:00-3:00 pm at 350 HMMB

Course Description:

This 3-unit course is designed for undergraduate students to gain a fundamental understanding of the science of polymeric materials. It introduces several types of polymerizations for polymer synthesis, glass transition temperature, polymer crystallization, polymer chain conformation in solution and in melt, thermodynamics of polymer blends and polymer solution, rubber, network and gels. Throughout the course, how this knowledge can be applied in the nanosciences, nanotechnology and biotechnology will also be briefly discussed.

Course Prerequisites:

Chem 1A or E 5 required, MSE 103 recommended. Please review basics covered in General Chemistry and Chem 1A. The current course is taught at sophomore level for Spring 2019.

Recommended Textbooks:

1. *Polymer Chemistry*, 2nd edition, by Paul C. Hiemenz and Timothy P. Lodge, CRC press.
2. Charles E. Carraher Jr., Carraher's Polymer Chemistry, 10th Edition.

Supplementary reading materials:

3. P.J. Flory, *Principles of Polymer Chemistry*; Cornell University Press: Ithaca, 1953.
4. R. J. Young and P.A. Lovell, *Introduction to Polymers,* 1991.
5. Michael Rubinstein and Ralph H. Colby, *Polymer Physics*; Oxford, New York: Oxford University Press, 2003.

Assessment of Student Progress:

Homework: 30%
Mid-terms: 30% (15% each)
Team project: 10% (5% for each role)
Final: 25%
Quizzes: 5%

A set of homework will be assigned. Only hard copy will be collected in class and no late

submission will be accepted. In order for you to prepare exams, answer keys will be given before the homework is due. Honor system will be applied for these cases. Homework will be collected but not scored for each specific question. But overall score will be given toward grade credit. There will be two mid-term exams and one final, in addition to a few quizzes randomly given throughout the course. There will be two team projects. Each of you will serve as presenter and judge, respectively for each. Logistic details will be discussed.

Polymeric Materials MSE 151 - Course Schedule

	Date	Content
1	1/23	Introduction to polymers
2	1/28	Common polymeric materials
3	1/30	Introduction to polymer fundamental
4	2/4	Step-growth polymerization
5	2/6	Step-growth polymerization
6	2/11	Chain-growth polymerization
7	2/13	Chain-growth polymerization
8	2/18	Academic holiday
9	2/20	Rational design of polymeric materials: how to characterize critical parameters?
10	2/25	Glass transition temperature
11	2/27	Glass transition temperature and polymer processing
12	3/4	*Mid-term I*
13	3/6	Group project: Recycle polymeric materials
14	3/11	Semi-crystalline polymer
15	3/13	Polymer Crystallization
16	3/18	Polymer Crystallization
17	3/20	Polymeric material design: processing and property
18	3/25	Spring break! Have Fun!
19	3/27	Spring break! Have Fun!
20	4/1	Polymeric materials for nanotechnology
21	4/3	Mid-term II
22	4/8	Polymer blends: fundamentals
23	4/10	Mid-term review
24	4/15	Thermodynamics of polymer blends
25	4/17	Thermodynamics of polymer blends
26	4/22	Polymer network, gel and rubber
27	4/24	Rational design of polymer gel
28	4/29	Group project: TBD
29	5/1	Review session