

## 202471 Polymer Engineering Course Syllabus

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**Lecture hour:** Sec 1 Tu W 9.00-10.30 E1401  
Sec400 M W 10.30-12.00 E1401

### **Course description** (Pre-requisite 403221 Organic Chemistry)

The principles and methods of polymer preparation, structure of polymer, physical properties, mechanical properties and other general properties, flow properties, additives, fabrication processes, and elastomer technology.

### **Course objectives**

After this course, students should understand the basic concepts and calculation in polymer science and engineering. More specifically, students should understand (1) how polymer molecules differ from small molecules, (2) how polymers can be synthesized, (3) how polymer structure can influence physical property, (4) how to characterize polymers to obtain information on chain microstructures and properties, and (5) how polymer products can be formed into various sizes and shapes.

### **Course outline**

- Introduction to polymeric materials
  - Concept and definitions
  - Classification of polymeric materials
- Molecular weight of polymer
  - Polymer molecular weights
  - Molecular weight measurements
- Polymer reaction
  - Step-growth polymerization
  - Chain growth polymerization
  - Copolymerization
  - Polymer reaction engineering
- Polymer structure and properties
  - Structure
  - Phase change phenomena
  - Polymer mixtures
  - Properties of polymer solids and liquids
- Characterization techniques

- Thermal analysis
- Mechanical analysis
- Polymer processing
  - Overview and classification of polymer processing operations
  - Selected polymer processing techniques
  - Selection of processing techniques
- Discussion on green polymer engineering

### Method

Lectures, in-class exercise, group discussion, presentation, and self-study

### Lecture tools

Overhead projector, whiteboard, lecture note, and handout

### Course Marking Scheme

Midterm exam (Tu 4 August 2009, 8.00-11.00)	40%
Final exam (W 7 October 2009, 13.00-16.00)	40%
Assignments (4-5 assignments)	10%
Class attendance	10%

### Course evaluation (Tentative)

Summation of adjusted marks will be used to evaluate students' performance.

A	= 80+	B+	= 75.0-79.9
B	= 70-74.9	C+	= 65.0-69.9
C	= 60-64.9	D+	= 55.0-59.9
D	= 50-55.9	F	< 49.9

### Office hour

Office: 1409-B

Office hours: M 9-10.30 and Tu 10.30-12.00

E-mail: [fengsia@ku.ac.th](mailto:fengsia@ku.ac.th)

### Main References

1. Rudin, A., The Element of Polymer Science and Engineering, 2<sup>nd</sup> edition, Academic Press, 1999.
2. Painter, P.C., Coleman, M.M., Fundamentals of Polymer Science, 2<sup>nd</sup> edition, Technomic, 1997.

## Tentative schedule

Week	Lecture	Chapter in Ref 1	Chapter in Ref 2
1	Course introduction Introduction to polymeric materials	1	1
2	Introduction to polymeric materials	1	1
3-4	Molecular weight of polymer	3-4	1,10
5-8	Polymer reaction	5-10	2-5
9	Midterm exam (Tu 4 August 2009, 8.00-11.00)		
10-12	Polymer structure and properties	4, 11-12	7-9, 11
13-14	Characterization techniques	11	---
15-16	Polymer processing	---	---
17	Final exam (W 7 October 2009, 13.00-16.00)		

\* No class during 6-13 July (APST1 Conference) and 28-31 July (KU convocation)

### SUGGESTIONS FOR FURTHER READING

- Rosen, S.L., Fundamental Principles of Polymeric Materials, 2<sup>nd</sup> edition, Wiley-Interscience, 1993
- Cowie, J.M.G., Polymers: Chemistry & Physics of Modern Materials, 2<sup>nd</sup> edition, Stanley Thornes, 1991
- Odian, G., Principles of Polymerization, 3<sup>rd</sup> edition, Wiley-Interscience, 1991.
- Rubinstein, M., Colby, R.H., Polymer Physics, Oxford University Press, 2003.
- Gedde, U.W., Polymer Physics, Kluwer Academic Publishers, 1995.
- Progelhof, R.C., Throne, J.L., Polymer Engineering Principles, Hanser, 1993