

Syllabus for VM517

Mechanical Properties of Polymers

Summer 2017

Course Description

The mechanical behavior of polymers from linear viscoelastic to yield and fracture are covered. Specific topics include dynamic-mechanical relaxations, creep, yielding, crazing, fatigue, and fracture mechanics. The materials include toughened plastics, polymer alloys and blends, and composite materials. Structured design with plastics is also considered.

Prerequisites: VM211 Introduction to Solid Mechanics

Contact Details & Office Hours

Instructor: Yunlong Guo
Email: yunlong.guo@sjtu.edu.cn
Office Hour: Monday(1 – 2 pm)@JI420 or by appointment

Textbook

- I.M. Ward and J. Sweeney, Mechanical Properties of Solid Polymers, 3rd Ed., John Wiley & Sons, Ltd., 2012 (recommended textbook)
- M.T. Shaw, W.J. MacKnight, Introduction to Polymer Viscoelasticity, 3rd Ed., John Wiley & Sons, Ltd., 2005
- J.D. Ferry, Viscoelastic Properties of Polymers, 3rd Ed., John Wiley & Sons, Ltd., 1980

Lecture

Students are expected to attend every lecture.

Quiz

Quizzes will be given in class. They are to help you gauge your progress.

Homework

Homework assignments will be given in the form of problem sets. Each assignment will have a due date, by which it should be handed over for grading. Late assignment will be not accepted.

Project

An individual project will be assigned before the first midterm exam. A project report and presentation are required for evaluation.

Exam

There will be two midterm exams and a final exam.

Grading Policy

Homework & Quiz (20%)

Project (15%)

Midterm Exam 1 (20%)

Midterm Exam 2 (20%)

Final Exam (25%)

Content and Overview

The semester is 13 weeks long. The following is a preliminary guide on the subjects covered in the lectures.

Week	Date	Lecture Subject
1	May 15	Introduction
	May 17	Glass transition and glassy state
2	May 22	Thermodynamic theories of glass transition
	May 24	Crystallization and liquid crystals
3	May 27	Linear viscoelasticity
	May 31	Linear viscoelasticity
4	June 5	Rubbery elasticity
	June 7	Polymer liquids
5	June 12	Midterm exam 1
	June 14	Experimental methods
6	June 19	Recent studies on polymer mechanics
	June 21	Nonlinear viscoelasticity, yielding, and fracture
7	June 26	Dynamics and molecular theory
	June 28	Polymer solution and blend
8	July 3	Block copolymer
	July 5	Colloidal Suspension, gel, and soft matter
9	July 10	Midterm exam 2
	July 12	Self-assembly
10	July 17	Optical and electric conducting polymers
	July 19	Technique for polymer study – thermal analysis
11	July 24	Technique for polymer study – diffraction and scattering method I
	July 26	Technique for polymer study – diffraction and scattering method II
12	July 31	Project presentation I
	August 2	Project presentation II
13	August 7	Final exam

Honor Code Policy

The rules for observing the Honor Code in this course are quite simple: you must never show any other student your written work. You are allowed to talk about the course work (the weekly assignments), but may not communicate in writing. For example, it is OK to tell another student “I solved this differential equation by substituting as for a homogeneous equation.” It is not OK to actually show another student the written calculations of how you did this. Of course, during exams, no communication of any kind (verbal or written) is allowed!