Polymeric Materials - Course Syllabus

Course Number: MSE 319

Course Title: Polymeric Materials

Academic Semester:	Spring	**Academic Year:**	2015/ 2016
Semester Start Date:	Jan 24, 2016	**Semester End Date:**	May 19, 2016

Class Schedule: Tues/Wedn 10.30-12pm

Classroom Number: R.3123 Classroom (22)

Instructor(s) Name(s): Pierre Beaujuge
Email: pierre.beaujuge@kaust.edu.sa

Office Location: 3276, Build. 5, Level 3
Office Hours: TBD
Teaching Assistant name:
Email:

COURSE DESCRIPTION FROM PROGRAM GUIDE

A description of the polymerization processes; polymer solutions (Flory- Huggins model and application to polymer blends); polymer chain conformations; calculation of end-to-end distribution function W(r) for short range interacting chains; rotational isomeric state scheme and temperature dependence; chain with long range interactions (excluded volume effect); radius of gyration; the crystalline and amorphous states of polymers; the glass transition (configurational entropy model); mechanical, electrical and optical properties and characterization of polymers.

COMPREHENSIVE COURSE DESCRIPTION

This course is intended to provide an overview of the design principles, characterization strategies, material properties, and applications of the various classes of polymers discovered over the years or currently under development. Of interest in this course: structure---function relationships, chain configuration and conformation, single chain dynamics, and basic principles of the thermodynamics of polymer solutions (e.g. Flory---Huggins theory) and gels. Specific emphasis will be on the thermal, mechanical, optical, and rheological properties governing polymeric materials, including “plastics” and rubbers. Glass transition phenomena, crystallization thermodynamics and kinetics, and phase separation events will be illustrated using representative examples from the literature. A number of methods commonly employed in the structural and morphological characterization of amorphous, semicrystalline and crystalline polymers will be detailed, including light scattering, small vs. wide angle x---ray scattering techniques (SAXS, 2D---WAXS, GIXRD), and atomic force microscopy vs. transmission electron microscopy. Polymeric materials will be discussed in terms of their morphological class with a focus on liquid crystalline polymers, polymer blends, block copolymers, and crystalline polymers forming lamellae or spherulites. The new areas of applicability of polymeric materials, and new material designs in the field, will be span throughout a series of short presentations developed by the students in coordination with the faculty (Advanced Topics). This course also includes an introductory lecture designed to provide basic knowledge in the fields of polymer rheology, polymer fracture, polymer viscoelasticity, and polymer degradation (hence setting the foundations for more advanced studies in these areas of research).

GOALS AND OBJECTIVES

Learning about Polymeric Materials, from fundamentals to advanced, modern applications.

REQUIRED KNOWLEDGE

TBD

REFERENCE TEXTS

N/A

METHOD OF EVALUATION

Graded content
Midterm evaluation. Short presentations. Final evaluation.

COURSE REQUIREMENTS

Assignments

Short Topical Presentations, Paper Presentations

Course Policies

Attendance is required.
All absences should be communicated and justified.

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.