

Descriptions of Courses

PSE501 Polymer Materials

The properties and application of various polymer materials will be covered. The course also covers new polymeric functional and structural materials applied in advanced technology of IT, BT and NT.

CBE552 Polymer Processing

This course covers several different processes related to the fabrication parts from polymeric materials and relevant mathematical modeling. Extrusion, injection and elongational processes are main concerns along with heat and mass transfer problem in these processes.

* Prerequisites: CBE451 (Polymer Structure and Bulk Properties)

CBE651 Multicomponent Polymer Materials

The synthesis, morphology, properties and application of the multi-component polymer materials are studied. Block and graft copolymer, polymer alloy and interpenetrating polymer networks (IPN) are studied as the multi-component polymer materials.

CBE652 Polymer Characterization

Theories and experimental method for the characterization of polymer materials are studied. Theories on molecular conformation, osmometry, X-ray, light scattering, rheometry, gel permeation chromatography are also studied.

CBE653 Mechanical Properties of Polymers

The equations to describe the elasticity and viscoelasticity of polymer solid are derived by using the continuum and statistical theories. They are applied to the analyses of isotropic and anisotropic polymers. The theories are compared with the experimental results of polymers with linear and nonlinear visco-elasticities. The yield and fracture behaviors of polymers are also studied.

CH671 Organic Chemistry of High Polymers

This course is designed to give graduate students in Chemistry a survey of the synthesis and reactions of organic polymers and their physical characterization including kinetics of radical species and condensation polymerization, stereochemistry of polymers, ionic polymerizations and other organic chemistry of polymers.

PSE511 Reactions of Polymers

The course reviews various chemical reactions between polymers. Several applications are introduced which can lead to new applications.

PSE512 Surface and Interface Properties of Polymers

The course correlates the chemical structure and surface characteristics. The surface exposed to air, the interface between two polymers are studied and the influence on aging, adhesion and mixing will be discussed. The surface treatment of biomedical polymers and the surface of membrane will also be studied.

MAE537 Optimal design of Composite Structures

This course is an introduction of anisotropic solid mechanics based on the classical plate theory (CLT). This course gives an insight on the properties of composite materials and helps to prepare computer programs for the stress and strain analyses. A brief experiment using an autoclave vacuum bag molding method is offered to manufacture a sand composite structure.

CBE551 Polymer Rheology

Constitutive equations are needed to describe the flow behaviors of polymeric liquids. In this course, differential and integral types of constitutive equations are derived using the continuum theory and the non-equilibrium thermodynamics. They are applied to the flow system of fluid.

CBE554 Polymer Physics

This course intends to provide a solid base for the understanding of polymeric materials. The microstructure of the chain molecule, the physical behavior and state of polymers are treated in this course. The emphasis of this course lies on fundamental physical concepts, terminology, and an overview of the phenomenology of polymer materials.

CBE555 Biopolymer

Introduction and classification of the biopolymers, their chemical and physical structures are studied. The application of biopolymers in biomedical, sensor, drug delivery, etc, are also studied.

BS584 Novel Drug Delivery Systems

This is a general education course of novel drug delivery systems (DDS), introducing sustained-release DDS formulation and targeted drug delivery systems. The importance and current problems concerning stabilization and formulation of DDS and gene delivery systems are the major topics of discussion in this course, as well as the design of polymeric scaffold system for effective drug delivery.

IE 643 Design and Analysis of Experiments

Theories of experimental design and analysis methods of experimental data with applications to industrial problems are introduced. Characteristics of various experimental designs and analysis of variance method are covered. Emphasis is placed on experimental methods for the design and improvement of products or processes and on optimal experimental design considering the cost and statistical efficiency.

CH672 Polymer Physical Chemistry

This course involves thermodynamic analysis of structure and properties of polymer systems. The focus here is on polymer structure, thermodynamics of polymer solutions, elasticity of rubber, phase equilibrium, friction, and transport processes.

CH673 Specialty Polymer Chemistry

This course involves synthesis and properties of photonically and electronically functional polymers. Focus is on conducting polymers, photoconducting polymers, photoresponsive polymers, nonlinear optical polymer, electroluminescent polymers, polymer batteries, and photoresists.

CBE682 Organic Nano-Structured Materials

This topics of this course includes: non-crystal, crystals, liquid crystals, imperfections in ordered media, and finally nano-structure. Because the properties of nanomaterials are structure-sensitive, numerous associations in this class will be made to establish structure-property relations for advanced organic materials using very useful experimental techniques, in particular, diffraction and microscopy. Applications to IT and BT devices using nanostructured materials are also discussed.

PSE711 Special Topics in Polymer Materials

Engineering plastics, high performance polymers, and functional polymers will be introduced and their characteristic properties are studied.

CBE731 Polymer Fluid Dynamics

Molecular approaches for the understanding of flows in the polymeric systems are the main issues here and rheo-optical experiments are also dealt to study the relationship between microstructure and properties of these system.

CBE751 Advanced Rheology of Polymer

Probability theories for the Rouse motion, hydrodynamic interaction and conformation of polymer are introduced to derive the diffusion equations and constitutive equation. The constitutive equations derived using phase-space and reptation theories are used to calculate the rheological properties of flexible and liquid crystalline polymers in dilute, concentrated or melt state.

CH773 Special Topics in Polymers Chemistry I

This course is composed of lectures on special topics selected from recent "hot topics" in polymer chemistry. The topics include synthetic metals, liquid crystals, photonic polymers, degradable polymers, thermoresistant polymers and new materials.

CBE851 Special Topics in Polymer Engineering

This course deals with recent trends of the properties of polymers, such as solution properties, solid properties, electrical properties, optical properties and mechanical properties. Recent topics on polymer characterization methods are also discussed.

PSE960 Thesis <Master Student>

PSE966 Seminar <Master Student>

PSE980 Thesis <Ph.D. Student>

PSE986 Seminar <Ph.D. Student>