

- **Course Description (Department of Polymer Science and Engineering)**

Advanced Polymer Chemistry
This course will introduce the recent progress in the study of polymer synthesis and characterization, with a special focus on controlled polymerization
Advanced Polymer Synthesis
Learn about advanced principle and application of the polymer synthesis conducted by mechanism of chain- and step-growth polymerization
Polymer Physical Chemistry
Topics such as the dimension and structure of polymer chain including configuration and conformation properties, the molecular weight and its distribution, polymer solution and its phase behaviors, diffusion phenomena and viscosity, and the bulk state of polymer will be discussed in the view point of both theories and their practical applications.
Advanced Physical Properties of Polymer
This course attempts to provide the basic principles and applications for static and dynamic light scattering of polymer solution and statistical mechanics for molecular motions.
Advanced Polymer Processing
Based on the polymer rheology, transport phenomena of polymer material occurring in the polymer process will be discussed. And the relation between the processing condition and physical properties after forming will be also included
Advanced Polymer Materials
A lecture dealing with recent trends and advanced information for preparation, properties, performances, functions and applications of thermoplastic and thermosetting polymer materials including general-purpose plastics, engineering plastics, and high-performance plastics.
Advanced Functional Polymers
This course covers synthesis, physical properties, principles and applications of mechanical, thermal, separation, biological, electrical and photo-functional polymeric materials.
Advanced Instrumental Analysis of Polymers
A lecture dealing with fundamental concepts and advanced theories of instrumental analysis of polymers including thermal, mechanical, chemical, and physical characterization methods.

Natural Polymers

This course deals with purification, structure, chemical reaction and applications of natural polymers such as fibrous protein, cellulose, chitin/chitosan, rubbers, lignin and so on.

Theory of Polymer Reaction

Topics such as the stereochemistry and chemical reaction through polymer catalysis and polymeric support, and practical application of polymer reaction will be discussed.

Advanced Synthetic Fibers

This course deals with nylon, polyesters, and their composites with high performance and high modulus

Advanced Polymer Rheology

This course is intended to explain rheological behaviours of polymeric materials, including continuum-derived theory, polymer molecular rheology, suspension rheology, etc.

Theory of Polymer Solution

This course provides the student with a theory of polymer solution, including solubility of macromolecules, configuration and conformation of chain molecules, and equilibrium properties of dilute solution.

Medical Polymer

This lecture introduces structure, physiological properties of biological components, biocompatibility, toxicity, immunological functions and drug delivery system of natural or synthetic polymers.

Advanced Polymer Morphology

Learn about synthesis, property, principle and process of polymer materials for mechanical, thermal, separational, biological, electrical and other applications.

Advanced Reaction Engineering of Polymerization

This course provides selection, control, and design of the reactor based on the basic principles of the molecular weight (MW), MW distributions, and compositions of copolymers.

Advanced Polymer Physics

Physical properties of polymer material at the various states such as rubbery, glassy, melting, and crystalline and mesomorphic one will be discussed.

Liquid Crystalline Polymers

Learn about correlation of synthesis, characterization, and structure-property relationship of liquid crystalline polymers and composites with the recent research and development trends

Heat Resistant Polymers

This course deals with general high temperature polymers based on polymer structures. Especially, this course emphasizes high temperature polymers of physical and chemical evaluations.

Seminar in Polymer 1

This course is a weekly seminar for graduate students. Students present seminars on current research topics and achievement in polymer science and engineering with discussion and critique from seminar participants.

Seminar in Polymer 2

This course is a weekly seminar for graduate students. Students present seminars on current research topics and achievement in polymer science and engineering with discussion and critique from seminar participants.

Advanced Polymer Composites

An analysis of the properties of composite materials consisting of various polymeric resin matrices and fiber reinforced materials is given an in-depth lecture on the contents of interest in industrial and academic aspects in the application field.

Advanced Viscoelasticity of Polymers

This course covers viscoelastic behaviours of polymers, such as creep, stress relaxation, and non-newtonian flow.

Tissue Engineering

Tissue engineering is newly emerging field focused on the construction of biological substitutes and for curing damaged tissue function of human body. This course will cover the introduction and principles of tissue engineering and the case studies for specific interested tissues and organs.

Polymers for Electrics and Photonics

Learn about synthesis, property, principle and industry of polymeric materials for electrics and photonic applications such as ferroelectric, conducting, nonlinear optical, organic electro luminescence (OLED) and OTFT technologies.

Polymers for Display Application

Learn about synthesis, property, principle and manufacturing of polymeric materials for display applications such as CRT, LCD, OLED, PDP, and FED technologies.

Rubber Science and Technology

A lecture dealing with fundamental theories and practical technology for understanding type, chemistry, structure, properties, compounding, processing and applications of rubbers.

Advanced Thermal Analysis of Polymers

Thermal analysis, such as differential scanning calorimetry, dynamic mechanical analysis, thermogravimetric analysis, and thermomechanical analysis, is explained, together with brief description of instruments and data analysis.

Advanced Carbon Composite Materials

A lecture dealing with fundamental concepts, fabrication, properties and applications of advanced carbon fiber-reinforced carbon matrix composite materials, which are simply referred to as carbon/carbon (C/C) composites, using carbon matrix derived from phenolic resin, pitch or CVD/CVI technology.

Composite Materials

A lecture dealing with different types of fiber-reinforced polymer matrix composites including fundamentals and basic concepts of polymer matrix resins, fiber reinforcement, interface, processing, properties, characterization, and applications in the academic and industrial viewpoints.

Soft Matter

The behavior and application of soft materials such as polymer and nanoparticles are covered.