**유기신소재공학과**

**Advanced Organic Materials Engineering**

**1.Department Introduction (학과소개)**

Material science which started with human evolution has become the basis of industrial advancement. Material science and remarkably developed scientific technology of 20th century saw the emergence of new advanced materials which leads from the front of the industrial growth in the 21st century. This new advanced materials science has developed in three different phases, Organic, inorganic and metals, and these three materials were in limelight and are still used as the basis for the industrial development. Among these, the new organic materials have been extensively used in industries and are in spotlight for its new found requirement in nano and medical technology applications. The organic(polymer) materials are therefore the most "in demand" materials among others.

 Staying in tune with industrial requirements, Yeungnam University has established Dept. of Advanced Organic Materials Engineering for graduate course on March 2012. The purpose of our department is to utilize the experience of the professors in developing programs for research and education. The department will train the "special" scientists and engineers with creative minds in field of advanced organic materials science desired in the university, R&D institutes and industries. Final goal is to prepare elaborately educated students to join the industries to transform the advancement in material science and to be active leaders for the new international material development.

Department of Advanced Organic Materials Engineering constitutes of 9 professors specializing in the field of polymer engineering, medical science and biology. The focus of the research in our department is the application of nano materials, medical materials, and technical fiber and film materials in the field of the information and communication technology, the environment, energy industries, and aerospace industries.

**Objectives of Education(교육목표)**

 The Department of Advanced Organic Materials Engineering was newly estabilished in 2012 to educate the graduate students who want to learn advanced materials regarding nanomaterials, medical materials, advanced fiber materials and state-of-art polymeric technology in depth. The department nurtures the young academic talent to open new chapter for science and technology in 21th century.

1) To understand the nano & medical materials as well as advanced organic materials and utilize these materials creatively in the field of industry and human life.

2) To develop talented young scientists and engineers having adaptable and conative job performance.

3) To produce scientific and academic manpower who can adapt fast changing environment and knowledge-based society.

4) To educate the people who can contribute their homelands and their societies positively based on the harmony between the human and the nature.

**2.List of Faculty Members (교수진)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Position | Name | Last School Graduated |  Degree | Major |
| Professor | Son, Tae Won | Seoul National University |  Ph.D | Polymer Materials |
| Professor | Kim, Joon Ho | Seoul National University |  Ph.D | Polymer and Functional Materials |
| Professor | Han, Sung Soo | Seoul National University | Ph.D | Medical and Biomaterials |
| Associate Professor | Oh, Tae Hwan | Seoul National University | Ph.D | Polymer Processing |
| Assistant Professor | Kim, Seong Cheol | University of Massachusetts (Lowell) | Ph.D | Organic Nano Materials |
| Assistant Professor | Kim, Se Hyun | Pohang University of Science and Technology | Ph.D | Nano Materials Processing |

**3.Academic programs (교육과정)**

**■ Basic Major Courses (기초공통)**

고분자재료특론 3credit

**Advanced Polymeric Materials**

분광분석학 3credit

**Spectroscopy**

고분자물성학특론 3credit

**Advanced Polymer Properties**

고분자물리특론 3credit

**Advanced Polymer Physics**

나노재료특론 3credit

**Advanced Nanomaterials**

유기재료합성특론 3credit

**Synthesis of organic macromolecules**

생명과학특론 3credit

**Advanced Life Science**

**■ Major Courses(전공)**

고분자화학특론 3credit

**Advanced Polymer Chemistry**

유기신소재특론 3credit

**Advanced Organic Materials**

기능성고분자특론 3credit

**Functional Polymeric materials**

기능성합성섬유 3credit

**Functional Synthetic Fibers**

계면화학특론 3credit

**Advanced Interface Chemistry**

천연고분자재료 3credit

**Natural Polymeric Materials**

산업섬유재료특론 3credit

**Advanced Industrial Textile Materials**

스마트재료특론 3credit

**Advanced Smart Materials**

조직공학특론 3credit

**Advanced Tissue Engineering**

생체재료특론 3credit

**Biomaterials**

바이오재료와센서 3credit

**Biomaterials & Sensor**

유변학특론 3credit

**Advanced Rheology**

고분자가공특론 3credit

**Advanced Polymer Processing**

실험계획법특론 3credit

**Advanced Experimental Design**

고분자물리화학 3credit

**Physical Chemistry of Polymer**

전자재료 3credit

**Principles of Solid State Electronic Devices**

나노공정특론 3credit

**Fabrications of Nanomaterials**

생화학특론 3credit

**Advanced Biochemistry**

고분자구조분석특론 3credit

**Advanced Polymer Structural Analysis**

복합재료학특론 3credit

**Advanced Composite Materials**

개별연구1 3credit

**Individual Research 1**

개별연구2 3credit

**Individual Research 2**

유기신소재공학과세미나 3credit

**Advanced Organic Materials Engineering Seminar**

**■ Courses Study(연구학점)**

석사연구학점(1) 2credit

**Master Course Study(1)**

석사연구학점(2) 2credit

**Master Course Study(2)**

석사연구학점(3) 2credit

**Master Course Study (3)**

박사연구학점(1) 2credit

**Doctor Course Study(1)**

박사연구학점(2) 2credit

**Doctor Course Study (2)**

박사연구학점(3) 2credit

**Doctor Course Study (3)**

박사연구학점(4) 2credit

**Doctor Course Study (4)**

석박사연구학점(1) 2credit

**Combined Master’s Doctor Course Study(1)**

석박사연구학점(2) 2credit

**Combined Master’s Doctor Course Study (2)**

석박사연구학점(3) 2credit

**Combined Master’s Doctor Course Study (3)**

석박사연구학점(4) 2credit

**Combined Master’s Doctor Course Study (4)**

석박사연구학점(5) 2credit

**Combined Master’s Doctor Course Study (5)**

석박사연구학점(6) 2credit

**Combined Master’s Doctor Course Study (6)**

**4.Course Description (교과목 개요)**

**■ Basic Major Courses (기초공통)**

고분자재료특론 3credit

**Advanced Polymeric Materials**

Scientific and technological knowledge of polymeric materials, which can be basic technology for the development of interesting new organic materials in specific industrial fields, will be understood. Preparation and characterization of polymers and their applications are practically introduced and advanced technologies for new polymers and organic materials are also provided. Furthermore, analysis of polymeric materials, investigation of polymer properties and proper application of polymers will be experienced.

분광분석학 3credit

**Spectroscopy**

The course gives basic principles of spectroscopy and outlines of methods and instruments for chemical analysis of organic materials. Special emphasis is put on the practical applications of analytical instruments including interpretation of spectra.

고분자물성학특론 3credit

**Advanced Polymer Properties**

Introduce advanced theories about the interrelationship among the polymer structure, physical properties, and useful behavior. This course covers, volumetric properties, Calorimetric properties, Transition temperatures, cohesive properties, interfacial energy properties, and rubber elasticity.

고분자물리특론 3credit

**Advanced Polymer Physics**

Advanced physics of organic and polymer materials are dealt with in this course. Kinetics, solution thermodynamics and conformational statistics of polymer chains are studied. Physical properties, molecular motion, dynamics, and molecular structures based on polymer physics are studied. Viscoelastic deformation based on infinitesimal deformation and rubber elasticity are dealt with in the course.

나노재료특론 3credit

**Advanced Nanomaterials**

This course is offered for the students who have already taken "Fabrications of Nanomaterials" in the previous semester. The students learn the basic quantum mechanical chemistry in the previous part of the course, the characterization of nanomaterials, physical phenomena in inorganic nanomaterials, and nanomagnetic materials and devices.

유기재료합성특론 3credit

**Synthesis of Organic Macromolecules**

"Synthesis of organic macromolecules" is opened for the graduate students who have already studied the polymer chemistry and polymer physics. The course teaches the synthetic methods of polymers using living radical polymerization such as ATRP, RAFT and NMP. Students learn living cationic and anionic polymerization to make block copolymers which can be used as basic materials for nanotechnology. In addition, this course teaches the control of tacticity using coordination polymerization and synthesis of polymers using enzymes.

생명과학특론 3credit

**Advanced Life Science**

This class will cover the important biological pathway from fertilization to development. The cycle from cell to tissue formation and molecular signalling that are important in the life cycle of humans and animals. Disease occurrence and immune development will also be covered in advance life sciences course.

**■ Major Courses(전공)**

고분자화학특론 3credit

**Advanced Polymer Chemistry**

Advanced chemistry of polymers i.e. synthesis, reaction and chemical changes of polymers and relationship between the chemistry and physical-structural properties will be scientifically understood. Theoretical and practical basis for the synthesis, reaction and chemical changes of polymers is also provided with the introduction of specific polymers.

유기신소재특론 3credit

**Advanced Organic Materials**

New organic materials required in advanced industries are studied through the scientific background, preparation method and application technology and industrial usage basic technologies for the development of new organic materials will be understood. And also core knowledges of manufacturing the new practical products of organic materials are obtained.

기능성고분자특론 3credit

**Functional Polymeric Materials**

For the rich understanding of scientific and technical basis of new polymeric materials, many kinds of functional and/or high-performance polymers will be introduced and experienced with their physical and chemical properties on the theoretical and practical point of view. Technologies for the synthesis and preparation, property analysis and test and application and usage of various specialty polymers will be provided for students to obtain sufficient knowledge of developing new functional polymeric materials.

필름재료특론 3credit

**Advanced Polymer Film Materials**

The course gives basic theories for the preparation methods and properties of film-forming polymers. Special emphasis is put on the technical aspect of film forming process and the industrial applications of polymeric films

기능성합성섬유 3credit

**Functional Synthetic Fibers**

The course gives theoretical background of preparation of high-functional synthetic fibers and specialty fibers used in various industrial fields. Special emphasis is put on the survey of concepts in the examples of commercial fiber products.

계면화학특론 3credit

**Advanced Interface Chemistry**

The course gives the basic theory of surface chemistry and details of interfacial phenomena which are applied in various industrial fields. Special emphasis is put on the practical applications of surfactants and the evaluation of surface free energy of polymer materials.

천연고분자재료 3credit

**Natural Polymeric Materials**

The course gives basic aspect of the properties, converting process and industrial applications of natural polymeric materials. Special emphasis is put on the technical problems in commercializing process and innovative methods for widening of industrial applications of natural polymers.

산업섬유재료특론 3credit

**Advanced Industrial Fiber Materials**

It is advanced lecture on not only concept and definition of technical fibers but process, structure and properties of high performance, functional and special-purpose fibers. This course covers environment, transport, civil architecture, medical, protective, and sports technical fiber applications.

스마트재료특론 3credit

**Advanced Smart Materials**

This class will cover the wide range of polymers that we stimulus responsive such as temperature, pH or special polymers like lactogen sensitive. The smart materials react specifically to the surrounding environment providing an intelligent approach in fabrication of specific system for various therapeutics.

조직공학특론 3credit

**Advanced Tissue Engineering**

The interdisciplinary study of combining biology in which class will cover about cells and cellular development and engineering side to cover the scaffold and biomaterial fabrication and synthesis combining both the steps for engineering tissue in both in-vitro and in-vivo.

생체재료특론 3credit

**Biomaterials**

This class will cover wide range of biomaterials currently used and history of these materials. The characterization of materials from mechanical to physical to chemical and ideal method for biomaterial fabrication for desired application. Range of testing that biomaterials needs before the application in the in-vitro system and finally in the human clinical trails.

바이오재료와센서 3credit

**Biomaterials & Sensor**

This class introduce the sensors that are used in engineering and bioengineering. It is lecture on understanding of basic concept of sensor, principles of sensor, and its applications. Class includes chemical sensor, physical sensor, bio sensor.

유변학특론 3credit

**Advanced Rheology**

Advanced rheology covers flow and deformation behavior of polymeric materials. Rheological properties and constitutive equations explaining the flow behavior of various polymers such as Newtonian and non-Newtonian fluids. Also, applications of rheology for industrial problems and measuring methods for the viscoelastic properties of polymers are dealt with in this course.

고분자가공특론 3credit

**Advanced Polymer Processing**

Advanced and recent polymer processing technology such as extrusion, injection molding, film blowing and casting is dealt with in this course. The dynamics, mass and heat transfer of polymer materials are studied. Applications of polymer processing for advanced materials and the manufacturing methods for improving material properties are studied.

실험계획법특론 3credit

**Advanced Experimental Design**

This course covers advanced experimental design related with polymer materials and process including a single factor, randomized complete block designs, factorial designs, and response surface design. Applications of experimental design for solving and analyzing industrial problems are studied.

고분자물리화학 3credit

**Physical Chemistry of Polymer**

Advanced physical chemistry for polymer science is dealt with including advance theories in polymer mixtures such as polymer solution and polymer-polymer blend. The course covers phase equilibrium and statistical dynamics of polymer-polymer miscibility based on theory of ideal solution, real solution, polymer mixtures and chemical equilibrium. Also, configuration and conformation of polymer chains are dealt with in this course.

전자재료 3credit

**Principles of Solid State Electronic Devices**

Modern science and technology are growing rapidly through the fusion of material science and physics and/or chemistry. "Principles of Solid State Electronic Devices" teaches the fundamental physical properties of materials and how to fabriate the electronic devices using the phenomena occuring in the semiconductors.

나노공정특론 3credit

**Advanced Processing of Nanomaterials**

Undergraduate students in the department learn how to make nanomaterials from their precursors such as polymers, organometallic compounds, gases, liquids, and solid bulk materials. Processing of nanomaterials as an advanced course offers graduate students how to fabricate the nanostructures using different instruments and to utilize the nanostructures as devices for certain applications.

생화학특론 3credit

**Advanced Biochemistry**

Advanced biochemistry is opened for the scientific study of the chemical compounds and chemical reactions that occur within the cells of living organisms. Much of advanced biochemistry deals with the structures and functions of cellular components such as proteins, carbohydrdates, lipids, nucleic acids. In addition, this course deals with enzymes and their function in the body.

고분자구조분석특론 3credit

**Advanced Polymer Structural Analysis**

This course covers advanced analysis on molecular structures of polymer materials. The course deals with advanced instrumental analysis on finding functional group, crystal structure, molecular orientation and crystal size, etc. Skill of analyzing the molecular structure of polymer materials and application for polymer industry are dealt with. Principles and application of advanced instrumental analysis such as X-ray, TEM, SEM are studied.

복합재료학특론 3credit

**Advanced Composite Materials**

Various advanced composite materials including polymer matrix composites are studied. Fabrication methods for composite materials and their properties are discussed. Strengthening and toughening as well as effects of microstructure and residual stress in the composites on physical properties are studied. Recent research and development of advanced nanocomposites are also discussed.

개별연구1 3credit

**Individual Research 1**

A thesis consists of an argument or a series of arguments combined with the description and discussion of research you have undertaken. In the case of a PhD and and a Masters (research) thesis, the research is expected to "make a significant contribution to the chosen field" This does not mean to revolutionise the field. You are expected to review critically the available publications in the field and attempt to add an element of original research to it. Researchers learn to know the role as a researcher, how to use softwares you need to use to write a thesis, and experimental skills to use in the experiments.

개별연구2 3credit

**Individual Research 2**

When we write a proposal or thesis, we often change or considerably develop what we think. Writing is not just translating into words the images of our thoughts; it's not as simple as that. In writing, we may transform our thoughts, redefine them or, with great pain and effort, give shape to our ideas. In Individual Research 2, students learn how to write academic proposal or thesis in an academic format and sense as well as the critical and logical interpretation of experimental results and documented results.

유기신소재공학과세미나 3credit

**Advanced Organic Materials Engineering Seminar**

Seminar course opened in the Department of Advanced Organic Materials Engineering is designed to introduce a variety of current research trends related to department majors and provide a place for in-depth discussions with researchers. In particular, speakers from this field are invited to participate in the synthesis and application of polymeric materials, the advanced nanomaterials as well as the biomedical materials.

**■ Courses Study(연구학점)**

석사연구학점(1) 2credit

**Master Course Study(1)**

석사연구학점(2) 2credit

**Master Course Study(2)**

석사연구학점(3) 2credit

**Master Course Study(3)**

박사연구학점(1) 2credit

**Doctor Course Study (1)**

박사연구학점(2) 2credit

**Doctor Course Study (2)**

박사연구학점(3) 2credit

**Doctor Course Study (3)**

박사연구학점(4) 2credit

**Doctor Course Study(4)**

석박사연구학점(1) 2credit

**Combined Master’s Doctor Course Study (1)**

석박사연구학점(2) 2credit

**Combined Master’s Doctor Course Study (2)**

석박사연구학점(3) 2credit

**Combined Master’s Doctor Course Study (3)**

석박사연구학점(4) 2credit

**Combined Master’s Doctor Course Study (4)**

석박사연구학점(5) 2credit

**Combined Master’s Doctor Course Study (5)**

석박사연구학점(6) 2credit

**Combined Master’s Doctor Course Study (6)**