

* 바이오산업자원공학전공 (Bioresources Engineering Major)

Introduction

This major focuses on the quest and research for organism-derived natural products, which are source materials of the bio-industry that will lead the 21st century.

We place emphasis on the research and education about the development and utilization of fusion technology that is required for organism improvement, which in turn, is needed for the industrialization of various biological materials.

Our goal is to foster practical and competitive professionals who can, immediately after graduation, contribute to the bio-industrial field, based on his or her deep knowledge and comprehension about all aspects of life phenomena. In order to achieve this goal, our department complementarily teaches both basic sciences such as biology, chemistry, and genetics, and applied studies such as breeding, genetic engineering, natural materials and engineering.

Therefore, applicants to our department are expected to have courage, creativity, and persistent integrity, by which to understand the converging and complex principles and knowledge of natural and applied sciences and to challenge new things by using them.

Educational goals

1. Fostering creative and dynamic talents leading the 21st century life sciences.

Career Path after graduation

1. Private sector companies (pharmaceutical companies, food companies, biotechnology companies, and seed companies, etc.)
2. State-run and private sector research institutes (Korea Research Institute of Bioscience and Biotechnology, breeding research centers run by private sector, etc.)
3. Public offices and public agencies (Ministry Agriculture, Food, and Rural Affairs, Rural Development Administration, Ministry of Trade, Industry and Energy, and The Korea Biotechnology Industry Organization, etc.),
4. Starting up own business (Bio-ventures etc.)
5. Professors and teachers

Curriculum

Major

1. Total Credits: 72 or more
2. Required Courses for major: 24 credits
3. Elective Courses for Major: 48 credits or more

Double Major

1. Total Credits: 39 or more

2. Required Courses for major: 15 credits
3. Elective Courses for Major: 24 credits or more

Minor

1. Total Credits: 21 or more from Bioindustry and Bioresources Engineering Major

2-1 Spring Semester

Required

- English Reading Practice 1
- General Microbiology and Lab

Elective

- Crop Cultivation and Practice
- Organic Chemistry
- Genetics

2-2 Fall Semester

Elective

- Biochemistry
- Plant Biology
- Resource Technology
- Molecular Microbiology and Lab
- Analytical Chemistry

3-1 Spring Semester

Required

- Plant Physiology and Lab
- Biochemistry and Lab

Elective

- Plant pathology
- Introductory Floriculture
- Introductory Genomics
- Bioinformaticis

3-2 Fall Semester

Required

- Plant Genetic Engineering and Lab
- Plant Breeding and Lab

Elective

- Plant Cell Biology
- Vegetable Crop Science
- Biopolymer Engineering
- Plant Developmental Biology

4-1 Spring Semester

Required

- Plant Molecular Breeding

Elective

- Independent Study and Career Skills 1
- Medicinal Botany
- Seed Production Science
- Plant Stress Biology
- Biological Signal Transduction
- Plant Metabolic Engineering

4-2 Fall Semester

Elective

- Independent Study and Career Skills 2
- Plant Molecular Design
- Plant Functional Genomics
- Cultivar Development and Protection Applications
- Environmental Biology
- Bioindustry
- Resource Plant Technology

Subject

바이오산업론(Bioindustry) / 3hours, 3credits

This lecture focus on the application of biotechnology in biotech-companies for understanding operation of biotech-companies. To achieve this object, this lecture consist of visiting biotech-companies and research centers, and special lecture series of researchers from the biotech-companies.

바이오자원공학(Resource Technology) / 3hours, 3credits

Recently, various applications using biotechnology are attracting attention. In particular, medicine, materials, and diagnosis applying life resources have become important industrial items. To this end, this class focuses on basic knowledge of life industry materials and resources, and their application and use.

바이오폴리머공학(Biopolymer Engineering) / 3hours, 3credits

This lecture focuses on the synthesis and degradation of individual macromolecules in the organism for industrial applications, such as proteins, nucleic acids, and carbohydrates among macromolecules in the living body.

분석화학(Analytical Chemistry) / 3hours, 3credits

The objective of the course is to study of the separation, identification, and quantification of the biomolecules from living matters. This course is also focused on the basic principles of various instruments including chromatography, IR-, NMR-, mass spectrometry and etc.

분자생물학및실험(Molecular Microbiology and Lab) / 4hours, 3credits

This course is to understand nucleic acids as genetic materials, DNA replication, DNA repair process, transcription and translation in prokaryote and eukaryote. Hand-on experience about basic DNA techniques will be also given to students in laboratory classes.

생물정보학(Bioinformatics) / 3hours, 3credits

Introduction to the basic bioinformatic tools and databases used in the collection and analysis of sequence data. Students will use web-based resources and learn the underlying algorithms.

생체신호전달(Biological Signal Transduction) / 3hours, 3credits

Plants cannot move away from harsh environments, because their roots are fixed to the soil. Instead, the sessile organisms have developed a diverse array of signal transduction pathways that allow them to cope with their adverse surroundings through evolution. This lecture encourages students to learn about the signaling mechanisms how the plants sense and respond to biotic and abiotic stresses.

생화학및실험(Biochemistry and Lab) / 4hours, 3credits

This course is based on basic biochemistry experiments that allow students who have taken general biochemistry to know proteins' actual properties and functions.

This course aims to enhance the understanding of general biochemistry by conducting experiments such as the separation and purification of proteins and confirmation of enzyme functions and lectures.

식물기능유전체학(Plant Functional Genomics) / 3hours, 3credits

Acquire basic knowledge to investigate the function of useful genes and acquire the basic ability to use plant genomics for breed improvement.

식물대사공학(Plant Metabolic Engineering) / 3hours, 3credits

This lectures focus on understanding bio-synthesis and utilization of primary-and secondary-metabolites. In addition, broaden understanding ways to industrialization of plant metabolites through metabolic engineering will be given

식물발달생물학(Plant Developmental Biology) / 3hours, 3credits

Molecular aspects of plant developmental process including fertilization, embryogenesis, differentiation of root, stem, leaf, and flower, and involvement of plant hormones are presented.

식물병리학(Plant Pathology) / 3hours, 3credits

This course is designed to introduce the student to commonly occurring plant diseases by viruses, bacteria, fungi in agriculture. Hand-on experience with classical and web based methods used in identifying causal organisms and diagnosing the diseases will be given. Also a theoretical introduction to molecular diagnosis is offered.

식물분자육종학(Plant Molecular Breeding) / 3hours, 3credits

This course is designed to introduce principles of molecular breeding including molecular marker, genetic map construction, QTL mapping, marker-assisted selection and biotechnology tools. Next breeding techniques including gene editing and genomic selection will be also covered.

식물생리학및실험(Plant Physiology and Lab) / 4hours, 3credits

Molecular aspects of plant physiology including photosynthesis, nitrogen fixation, water/nutrients transport, and cell walls are presented. In addition, students perform related fundamental experiments to understand physiological process.

*Class for Forest Recovery Manager

식물세포생물학(Plant Cell Biology) / 3hours, 3credits

This course is a study at the cellular and molecular level of plant organelles, cell membranes, cell division, endocytoskeleton, and intercellular signal transduction. In addition, the molecular control mechanisms of plant growth and development are studied in depth at the cellular level.

식물스트레스생물학(Plant Stress Biology) / 3hours, 3credits

Introduce the plant stresses and its responses. Toxic mechanisms such as high or low temperature, lack of moisture, high salinity, strong light, ultraviolet rays, ozone, and heavy metals that act as stress on plants and the resistance mechanisms of plants will be lectured in terms of molecular biology. It is also explained in terms of usability.

식물유전공학및실험(Plant Genetic Engineering and Lab)/ 4hours, 3credits

This course covers a fundamental understanding of bioinformatics and how to clone and characterize a gene in plants. It also provides students with an opportunity to experience modern biotechnologies, which include generation and selection of transgenic plants, use of reporter genes, particle bombardment,

protein-protein interaction, protein expression and purification in E.coli, VIGS, and CRISPR-Cas9 system.

식물육종학및실험(Plant Breeding and Lab) / 4hours, 3credits

Lectures on breeding methods for developing new varieties(cross breeding, backcross breeding, mutation breeding, microspore culture breeding etc.)and acquires basic breeding skills through experiments.

식물학(Plant Biology) / 3hours, 3credits

This course is designed to help students gain a solid foundation in fundamental concepts of plant structure and physiology. It also covers plant-specific metabolisms, growth, development and reproductive processes.

약용식물학(Medicinal Botany) / 3hours, 3credits

The types, characteristics, various uses and application principles, and types of medicinal plants that are raw materials for medicinal and health functional foods from plant resources are dealt with in connection with botanical characteristics.

유기화학(Organic Chemistry) / 3hours, 3credits

Organic chemistry has moved to center stage in fields from medicine to agriculture. Now more than ever before, a basic understanding of chemistry is critical to addressing complex, interdisciplinary problems. This course provides a fundamental knowledge of organic chemistry, which includes the structure, reactivity, and properties of the four major organic macromolecules in living organisms.

유전체학개론(Introductory Genomics) / 3hours, 3credits

This course provides an introduction to genomics including genome organization in eukaryote and prokaryote. This course also covers the principles and methods of genome sequencing, assembly and annotation.

일반미생물학및실험(General Microbiology and Lab) / 4hours, 3credits

The objective of the elementary course is to study of the structure and growth of microorganisms and basic laboratory skills in practical microbiology. The roles of microbes in the plant science and agriculture will be considered.

일반생화학(Biochemistry) / 3hours, 3credits

The lecture is given to understand the various biological phenomena that occur in living things through the structures of macro-molecules such as nucleic acids, proteins, lipids, and carbohydrates

일반유전학(Genetics) / 3hours, 3credits

The course covers topics on basic concepts of classical and molecular genetics, including Mendelian genetics, genetic mapping, the genetic code, gene transcription and translation, regulation in prokaryotes and eukaryotes.

자원식물공학(Resource Plant Technology) / 3hours, 3credits

The genetic resources is a key factor for determination of bio-industry future. This lecture includes classification and utilization of divergent types of genetic resources

재배학및실습(Crop Cultivation and Practice) / 4hours, 3credits

Lectures on the cultivation, disease, physiological phenomena, and basic needs for growth of plants, which are the basis of basic food for humans, and deepen their understanding through practice.

종묘생산학(Seed Production Science) / 3hours, 3credits

This course understand the seed production process of useful plant resources, acquire knowledge, and review practice to deepen understanding.

졸업연구및진로1,2(Independent Study and Career Skills/Senior Project 1,2) / 1hours, 1credits

This lecture focus to help students design an effective career path after graduation. To achieve this object, the student should perform a project or write a thesis.

채소학(Vegetable Crop Science) / 3hours, 3credits

Students will learn about physiology, breeding, production, and essential nutritional elements of vegetable crops.

품종개발및보호출원(Cultivar Development and Protection applications) / 3hours, 3credits

This section explains the process of breeding methods for varieties, development process, crop seed production and distribution, and plant vareity protection system.

항체공학(Antibody Engineering) / 3hours, 3credits

Antibodies are widely applied from basic scientific research to industrial applications, and in the field of biopharmaceuticals, antibody production and immunoassay using antibodies are essential fields. In recent years, starting with cell fusion methods, it has become possible to recombine antibody molecules with high antigen specificity and affinity using genetic engineering methods. This subject covers the function and structure of the antibody, the development method of recombinant antibodies, and various immunoassay methods.

화훼학개론(Introductory Floriculture) / 3hours, 3credits

Based on basic theories and general knowledge such as definition, classification, item-specific characteristics, cultivation, etc. of ornamental crops, students will examine and acquire techniques for using flowers and creation of usability.

환경생물학(Environmental Biology) / 3hours, 3credits

Lectures about behaviour biology, ecology, and environmental pollution are presented to understand interaction between organism and environment.