Department of Biology

There can be little doubt that we are living the age of Biology. [Biology](http://en.wikipedia.org/wiki/Biology) is the study of [living organisms](http://en.wikipedia.org/wiki/Living_organisms) and the [phenomena](http://en.wikipedia.org/wiki/Phenomenon) related over a broad spectrum of academic fields that are often viewed as independent disciplines, from molecular biology to ecology. Over the last few decades the application of molecular and computational techniques to the solution of biological problems continues to develop such diverse disciplines as medical diagnosis and treatment, pharmacology, agriculture and exobiology. Our department has developed a unique graduate program for our students to acquire both a strong foundation in the principles of modern biology and exposure to contemporary thinking in a wide variety of specific fields. Our graduate students become involved in many of the most significant research accomplishments of the Department and go on to become leaders in their fields, both in academic and industrial settings.

The department provides 8 basic courses, 7 research programs and 48 advanced courses. Graduate students have the opportunity to participate in one of six [faculty research laboratories](http://web.mit.edu/biology/www/facultyareas/viewalpha.html): (1) Animal Systematics and Phylogenetics, (2) Plant Molecular Systematics and Phylogenetics, (3) Developmental Genetics, (4) Animal Physiology, (5) Behavioral Ecology and (6) Environmental Ecology. The Department of Biology is well equipped with the state-of-the-art research facilities that are fully staffed including electron microscopy facility, growth control rooms, core analytic facility, cold rooms, green houses, animal care facility, dark rooms and cell & tissue culture facility.

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| Position | Name | Education | Degree | Major |
| Professor | Jong-Wook Lee | Korea University | Ph. D | Animal Sytematics and Phylogenetics |
| Professor | Seon-Joo Park | Korea University | Ph. D | Plant Sytematics and Phylogenetics |
| Professor | Siuk Yoo | University of Tennessee | Ph. D | Developmental Genetics |
| Professor | HoYoung Suk | Seoul National University | Ph. D | Behavioral Ecology |
| Professor | Gab-Sue Jang | Kyungpook National University | Ph. D | Environmental Ecology |
| Assistant professor | Minseok Song | Pohang University of Science and Technology | Ph. D | Molecular Cell Biology |

**Course Description**

■ 기초공통(Basic Major Courses)

면역학 3 credit

(IMMUNOLOGY)

The course is to understand the concepts of immune system and mechanism in health and disease.

Immune response occurring in animal body including human beings, as a protective mechanism against foreign life (invaders such as bacteria or virus), will be taught at the level of cell and molecular biological point of views.

미생물학특론 3 credit

(ADVANCED MICROBIOLOGY)

The basic on microorganisms, especially physiology, morphology, metabolism, molecular genetics, immunological properties of bacteria, fungi and virus will be instructed for enhancing the capability to apply microbial metabolism and physiological state on biotechnology research.

분자생물학 3 credit

(MOLECULAR BIOLOGY)

This course deals with basic and applied skills for molecular biology field, and practical applications in various biological samples. The main topics include

생물화학특론 3 credit

(ADVANCED BIOCHEMICAL ENGINEERING)

Biological Chemistry is a basic science to understand the fields of biochemical engineering, bio-technology, and genetic engineering in terms of chemistry. The goal of this class is to develop the capability of analyzing the phenomenon of life science.

생태학특론 3 credit

(ADVANCED ECOLOGY)

세포생물학특론 3 credit

(ADVANCED CELL BIOLOGY)

This course will focus on understanding principles and recent progress of cell biology which is fundamental to all of the biological sciences. This course is designed for graduate students who have completed an undergraduate cell biology course. Topics include the principles of cellular organization and function, regulation of the cell cycle, interactions between cells and cellular signaling pathways.

유전학특론 3 credit

(ADVANCED GENETICS)

Advanced molecular analysis of prokaryotic and eukaryotic genetic material(bacterial, viral, plant, and animal) at the molecular level including: replication, transcription, repair, recombination, control of gene expression: genetic engineering, molecular genetics of cancer development, human gene therapy, and human molecular genetics: genetics of developmental processes of plants and animals: detailed analysis of the molecular structure and function of developmental regulatory genes: and techniques of genetic analysis of developmental systems.

계통학 특론 3 credit

(ADVANCED TOPICS IN PHYLOGENETICS)

This course deals with morphology and criteria at the molecular and analyses about relationship, evolution trends, gene structure, structure of RNA, and speciation so on. The lectures address most of the fallowing topics. 1) method of cladistic data matrix, 2) character of weighting, 3) method of consensus, 4) method of tree test etc.

■ 전공

개별연구(1) 3 credit

(INDEPENDENT STUDY (1))

개별연구(2) 3 credit

(INDEPENDENT STUDY (2))

생물학과세미나 1 credit

(BIOLOGICAL SEMINAR)

■ 생물학전공(BIOLOGY)

관속식물분류학 3 credit

(VASCULAR PLANT TAX0NOMY)

It is clear relationship and each taxon that ensue in Cronquist's taxonomic system through knowledge that is modern science about vascular plant. It handles description and identification such as more detailed species speciation and process and aspect of variation.

곤충생리학 3 credit

(INSECT PHYSIOLOGY)

Insect physiology studies the principle of Insect life phenomenon by focusing on the function of organisms. Included are the physiological process, based on homeostatic control mechanism, in the nervous system, circulatory system, respiratory system, excretion system, metabolism, and behavior.

곤충생태학특론 3 credit

(ADVANCED INSECT ECOLOGY)

This course is to study of how insects, individually or as a community, interact with the surrounding environment or ecosystem. Insects play significant roles in the ecology of the world due to their vast diversity of form, function and life-style; their considerable biomass; and their interaction with plant life, other organisms and the environment.

곤충학특론 3 credit

(ADVANCED ENTOMOLOGY)

Entomology is the study of insects and their relationship to humans, the environment, and other organisms. Entomologists make great contributions to such diverse fields as agriculture, chemistry, biology, human & animal health, molecular science, criminology, and forensics.

광합성론 3 credit

(PHOTOSYNTHESIS)

기생충학특론 3 credit

(ADVANCED PARASITOLOGY)

This course is to study about parasites over kingdom of protista including classical parasites for example Tapeworms ,Flatworms, etc. and parasites form fungi, furthermore intracellular parasites for examples Leishmania, Plasmodium etc.

동물발생학특론 3 credit

(ADVANCED ANIMAL EMBRYOLOGY)

This special lecture series provide a forum for discussion of the current trends in ADVANCED ANIMAL EMBRYOLOGY. Faculty and invited speakers will present current research topics together with students presentation.

동물분류학특론 3 credit

(ADVANCED SYSTEMATIC ZOOLOGY)

This study is to study of identifying different organisms, classifying them into categories, and naming them. All organisms, both living and extinct, are classified into distinct groups with other similar organisms and given a scientific name. The classification of organisms has various hierarchical categories.

동물비교해부학특론 3 credit

(ADVANCED ANIMAL COMPARATIVE ANATOMY)

This course is to study of the body structures of different species of animals in order to understand the adaptive changes they have undergone in the course of evolution from common ancestors. The field is largely confined to the study of the vertebrate animals.

동물생리학특론 3 credit

(ADVANCED ANIMAL PHYSIOLOGY)

The class will teach students to understand how animals maintain their life by teaching anatomical characteristics and functions of various organs in animal body.

동물조직배양 3 credit

(ANIMAL TISSUE, CULTURE)

Cell and tissue, environmental condition and organ, history of tissue culture, necessity and applicable field of tissue culture, actual and practical tissue culture technique, and future prospective of this technique are included.

This course introduces the phenomenon of the structure, function, and physiology of the cell.

동물학특수연구 3 credit

(SPECIAL TOPICS ZOOLOGY)

This course is intended for the graduate students preparing the thesis. This course involves study and discussion of special problems in individual research project, usually carried out under the supervision of the advisor.

Handle theory and directions of special procurements appliances connected with an experiment for preparing the thesis.

무척추동물학 3 credit

(INVERTEBRATE ZOOLOGY)

Course activities include a detailed comparative study of the structure and adaptations of invertebrates. This course will provide a basis for proper invertebrates procedures and the methodology for the study of invertebrates structure.

발생유전학특론 3 credit

(ADVANCED CONCEPTS IN DEVELOPMENTAL GENETICS)

The purpose of this course is to study advanced concepts related to genetics/developmental biology with information taken from current literature. The main subjects in this lecture are gamatogenesis, both spermatogenesis and oogenesis, fertilization, focusing on sperm-egg membrane interaction, and embryogenesis, focusing on early stages. The course also covers aspects of sex determination, sex differentiation, and X-chromosome inactivation that occurs for sex-chromosome dosage compensation in animal cells. Specific subject area to be announced.

분계학특론 3 credit

(CLADISTICS)

This course is organized to study current topics in the field of component, Hennnig 86, PAUP, and PHYLIP using partial computer program. Also, we learned about parsimony, consensus tree, and cladistic biogeography of basic knowledgement of Cladistic.

비관속식물학 3 credit

(NONVASCULAR BOTANY)

It handles general problem about micromorphology, morphology, reproduction, and life cycle of algae, thallophyte, moss plant, bacillus plant, lichen etc., and lecture about phylogenetic relationship and physiological characters, ecology by species.

생리화학 3 credit

(PHYSIOLOGICAL CHEMISTRY)

Topics in physiological chemistry including nucleic acid replication, transcription, and translation; genetic and epigenetic regulation; bioenergetics and control of metabolism; alternative metabolic strategies; and enzyme structure and mechanism. This course is designed for graduate students who have completed an undergraduate physiology and biochemistry courses.

세포생리학 3 credit

(CELL PHYSIOLOGY)

This course will examine several basic concepts in cell physiology and will illustrate general physicochemical principles using examples from vertebrate, invertebrate and plant systems. There is an emphasis on electrical properties, ion transport proteins, signalling via second messenger, mechanisms of cell homeostasis, and epithelial transports.

식물계통학특론 3 credit

(ADVANCED PLANT SYSTEMATICS)

식물군락생태학 3 credit

(PLANT COMMUNITY ECOLOGY)

식물발생학 3 credit

(PLANT EMBRYOLOGY)

Masters basis know-how of form stay etc.. of plant and handles development of plant and process of differentiation synthetically from physiological hereditarian viewpoint and understands peculiar special quality of plant as rise living things generally. also, widen comprehension of field of botany as life science all Confusius by studying basis of main field handling in modern botany.

식물생리학특론 3 credit

(ADVANCED PLANT PHYSIOLOGY)

식물생장조절론 3 credit

(PLANT GROWTH REGULATION)

Growth and control of plant search effect and conditions that get in growth including photosynthesis as vegetable cell dialogue's central research task and study about their control function.

식물생태학특론 3 credit

(ADVANCED PLANT ECOLOGY)

식물세포생물학 3 credit

(PLANT CELL BIOLOGY)

식물유전학특론 3 credit

(ADVANCED PLANT GENETICS)

Basic theory and the up-to-date research tendency about plant characteristic heredity are introduced. It is studied genome-organization and chromosome, double fertilization and genetics of higher plant. cytoplasm genetics, cultivation and population genetics.

식물조직배양 3 credit

(PLANT TISSUE CULTURE)

Plant tissue culture is a epoch-making technology that can be applied to rapid propagation, virus-free plant production, and breeding. Understanding for tissue culture principle and culture method for cell, tissue, and organ is preceded for practical application to industry.

식물학특수연구 3 credit

(SPECIAL TOPICS IN BOTANY)

식물형태학특론 3 credit

(ADVANCED PLANT ANATOMY)

It is arrange taxon of internal and external morphology. Do to understand morphological characters and evolution process. especially, anatomical characters and phylogenetic system does to link. Also, put emphasis to understand embryogenesis and organogenesis in molecular biology.

식물형태형성론 3 credit

(PLANT MORPHOGENESIS)

염색체특론 3 credit

(SPECIAL TOPICS IN CHROMATIN)

This course is organized to study current topics in the field of chromatin structure and roles of chromatin in gene regulation and chromosomal function. The lectures address most of the fallowing topics; 1. chromatin structure such as core histones and nucleosome structure, histone modifications, chromatin structure at centromeres and telomeres, chromatin condensation during the cell cycle, and chromatin assembly during replication. 2. chromatin and gene regulation such as transcription factors and histone modification, remodeling complexes, silencing complexes, heterochromatin, and recombination.

유전공학응용론 3 credit

(PRACTICAL APPLICATIONS IN GENETIC ENGINEERING)

This course deals with basic skills of genetic engineering and practical applications in various biological samples. The subjects include enzymatic manipulation of DNA and RNA, mutagenesis using PCR, cloning and expression of foreign protein in bacterial cells, preparation and analyses of protein gel (SDS-PAGE), and southern, northern, and western blot. The course also introduces basic immunology techniques such as preparations both of monoclonal antibodies and polyclonal antibodies, and principal applications such as immunohistochemistry and ELISA. Students participate in lectures and labs.

인류유전학 3 credit

(HUMAN GENETICS)

This course deals with basic skills and applied methods for human genetic field. The main topics include chromosome mutations such as deletion, insertion, inversion and translocation, and gene mutations such as base substitutions, small indel and frameshift mutation etc.

인체생리학특론 3 credit

(ADVANCED HUMAN PHYSIOLOGY)

The course is about a study of the life processes in human, with emphasis upon basic mechanisms. The course is intended to enable the students to understand the specific functions and their cooperation for the maintenance of homeostasis in cardiovascular, respiratory, application in reproductive systems. It offers basic knowledge for proper application in related academic field.

전자및형광현미경응용론 3 credit

(ELECTRON AND FLUORESCENCE MICROSCOPY)

This course covers practical application to techniques for preparation of biological samples for viewing in TEM (transmission electron microscopy) and SEM (scanning electron microscopy). Use of microscope and ancillary equipment, dark room techniques and digital image processing, preparation of materials for publication and special project. The course also includes fluorescence microscope for immunohistochemistry (immunofluorescence staining) of various samples. Admission limited only to departmentally approved graduate students.

정량생태학 3 credit

(QUANTITATIVE ECOLOGY)

The studies on quantitative analysis of density changes during the community growths, environmental effects, distribution patterns, interspecific competitions, community analysis and discription, calculation of community linking variables, interspecific correlations, classification and ordination of communities, species diversities, energy flows and material cycles in community.

초파리 유전학 3 credit

(DROSOPHILA GENETICS)

This course deals with Drosophila melanogaster that is the most popular model organism in studying classic genetics as well as modern genetics. the main subjects of the course are life cycle of Drosophila and culture methods, mutagenesis, transposon elements, chromosome analysis, looking at embryos, immunolabelling, population genetics, behavior and learning, cell culture etc.

진화생물학특론 3 credit

(ADVANCED EVOLUTIONARY BIOLOGY)

Evolutionary biology focuses on the processes of evolution and the patterns generated by these processes. The aim of this course is for students to develop a scientific "way of thinking" about the tremendous diversity of life rather than simply trying to memorize the history of living things. Topics covered include advanced population genetics, the advanced theory of evolution by natural selection, concepts of fitness and adaptation, genetic and developmental bases of evolutionary change, molecular ecology, sexual & kin selection, extinction and human evolution. By the end of the course, students will be able to see how evolution provides a framework for the broader field of biology and how evolutionary theory can be used to address important epidemiological and social issues.

집단유전학 3 credit

(POPULATION GENETICS)

This course will serve as an introduction into the field of population and statistical genetics. Of primary importance is an understanding how to estimate population parameters that are important descriptors of genetic variation and the various genetic forces that result in evolutionary changes through time. Overall, the aim of this course is to help students obtain a fundamental understanding of population genetic principles and of the uses of molecular, biochemical, and quantitative genetic data in areas of landscape ecology, forensics, resource management, and evolutionary biology.

보전생물학특론 3 credit

(ADVANCED CONSERVATION BIOLOGY)

In this course, students seek to understand biodiversity on several different levels: genetic, organismic, population and landscape, and learn how to draw on scientific evidence to make decisions about conservation of all forms of life. Students should read primary literatures, have small group discussions and write their own conservation plans to achieve critical thinking skills in evaluating literature. In addition, contemporary management strategies for various ecosystems will be examined to collate many ideas for the protection and restoration of our endangered species.

행동생태학 3 credit

(BEHAVIORAL ECOLOGY)

Behavioral ecology investigates the actions of animals in reference to their evolution, environment and interactions with other organisms. Behavioral patterns can be determined by natural selection acting on genomes functioning under particular ecological context. Hence, this course will focus on the animal behavior that is related most directly to survival and reproduction in the wild. Topics include the evolution of social behavior, mating systems, sexual selection, alternative reproductive behaviors, life history strategies, optimal foraging, territoriality, cooperation and conflict, host-parasite co-evolution, the ecology of communication, and comparative analyses. The course emphasizes basic concepts and theory as well as model-based and experimental approaches to exploring questions in Behavioral Ecology.

분자생태학 3 credit

(MOLECULAR ECOLOGY)

Molecular ecology is a field of ecology that is concerned with applying molecular population genetics, computational techniques, and more recently genomics to help biologists understand the ecology and evolution of organisms in the wild. The topics covered in this course include genetic diversity, population genetic structure, kinship, environmental genomics and community phylogeny. Students will learn the strength and limitations of different classes of molecular genetics, and will analyze datasets in the class to gain familiarity with available techniques.

생태모델링 3 credit

(ECOLOGICAL MODELING)

Researchers and scientists use models to organize and advance our understanding of the way ecosystems work and how ecosystems are responding to global change. Environmental managers, policy makers, and other decision makers also use models to forecast the potential ramifications of decisions.

A goal of the course is to help students become more sophisticated users of models and interpreters of model results. This course develops the systems perspective of the environment as a framework for building and applying models.

The course consists of a series of case studies of types and classes of models: individual-based models, population growth models, biogeographical approaches, models of coupled human-natural systems, and others explaining spatial genetics.

In discussing each broad class of models, we will learn methodologies for model building and application and critically analyze particular models.

경관생태학 특론 3 credit

(ADVANCED LANDSCAPE ECOLOGY)

This course will explore the concepts that underlie landscape ecology and are arranged into modules of different length and difficulty. We will give you the necessary background to understand the landscape ecology, and several field works and reviewing readings will enhance your knowledge of dealing outside landscape.

Our focus will be on learning appropriate theory, making distinctions between important concepts, and trying to understand how the