미생물생명공학과

(DEPARTMENT OF APPLIED MICROBIOLOGY & BIOTECHNOLOGY)

**Department Introduction**

The Department of Applied Microbiology & Biotechnology provides the academic home for a highly interactive group of investigators whose research emphasizes on problems relevant to human health, functional foods, pharmaceutical drugs, agricultural products, bioremediation, or bioindustries. In addition to our research, our mission is to train and educate graduate students in applied microbiology. Our faculty trains graduate students pursuing their MS or PhD degree in studies including biochemistry, molecular biology, molecular biotechnology, microbial genetics, industrial microbiology, and bioprocess engineering. There are also available for postdoctoral positions for careers in applied microbiology and biotechnology.

**List of Faculty Members**

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| --- | --- | --- | --- | --- |
| Position | Name | Last School Graduated | Degree | Major |
| Professor | Hong, Nam Joo | Korea Univ., Korea | Ph.D | Biochemistry |
| Professor | Kim, Sang Dal | Kyungpook National Univ., Korea  | Ph.D | Microbial genetics |
| Professor | Jo, Youl Lae | Nagoya Univ., Japan  | Ph.D | Molecular Biology,Genetic Engineering |
| Professor | Khang, Yong-Ho | Texas Tech Univ., USA  | Ph.D | Biochemical Engineering |
| Professor | Park, Yong Ha | The University of Tokyo, Japan  | Ph.D | Microbiology |

**Academic programs**

* MS (Master of Science)
* PhD

**Course Description**

■ Basic Major Courses

미생물유전학특론 3 credit

(ADVANCED MICROBIAL GENETICS)

Lecture for genetics, mutation, gene damage repair, bacterial transformation, conjugation, transduction and gene structure of microorganisms. The study of how genes are organized and regulated in microbes in relation to their cellular functions

분자생물학특론 3 credit

(ADVANCED MOLECULAR BIOLOGY)

This is intensive course focusing on concepts, mechanisms and methods of molecular biology. The topic areas include: methods for studying nucleic acids and genes, structure and organization of genes, and mechanisms of gene expression and regulation. The course will emphasize readings from the current literature.

산업미생물학특론 3 credit

(ADVANCED INDUSTRIAL MICROBIOLOGY)

Of major economic, environmental and social importance, industrial microbiology involves the utilization of microorganisms in the production of a wide range of products, including enzymes, foods, beverages, chemical feedstocks, fuels and pharmaceuticals, and clean technologies employed for waste treatment and pollution control.

생물화학공학특론 3 credit

(ADVANCED BIOCHEMICAL ENGINEERING)

This course is to study the kinetic models of biological reaction including the microbial fermentation, multiple enzyme reactions, or bioseparation. Numerical integration will be performed with an Excel-VBA program for biosimulation.

생화학특론 3 credit

(ADVANCED BIOCHEMISTRY)

Advanced biochemistry course is designed for the graduate students who have already taken basic biochemistry or related classes during their undergraduate course and want to learn more higher level of biochemist as a graduate majoring in biotechnology. The organic structure and synthetic process of each biological material, and biochemical metabolic pathway of each nutrient in cell will be deeply discussed through the class.

■ Major Courses

개별연구(1) 3 credit

(INDEPENDENT STUDY (1))

개별연구(2) 3 credit

(INDEPENDENT STUDY (2))

미생물학과세미나 1 credit

(APPLIED MICROBIOLOGY SEMINAR)

특수문제연구(1) 3 credit

(SPECIAL STUDY(1))

■ 미생물생명공학전공

(APPLIED MICROBIOLOGY AND BIOTECHNOLOGY MAJOR)

구조해석분석학 3 credit

(STRUCTURAL ANALYSIS)

This course discusses relationships between organic functionality and the observed spectroscopic properties of organic molecules. These relationships are then rationalized and used to logically deduce structures to unknown compounds. Mass Spectrometry, Nuclear Magnetic Resonance, Infrared and Ultraviolet Spectroscopy will be applied in the structural assignment of unknown compounds.

면역학특론 3 credit

(ADVANCED IMMUNOLOGY)

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. In addition, the fundamental theories and practical approaches to generate antibody to use as a tool for highly valuable medicine to cure disease will be also covered in the class.

미생물생리학특론 3 credit

(ADVANCED MICROBIAL PHYSIOLOGY)

The course topics will focus on microbes, transport through cell membrane, cell movement, and metabolic processes.

미생물생태학특론 3 credit

(ADVANCED MICROBIAL ECOLOGY)

Microbial ecology is the relationship of microorganisms with one another and with their environment. It concerns the three major domains of life ？ Eukaryota, Archaea, and Bacteria ？ as well as viruses. Microorganisms, by their omnipresence, impact the entire biosphere. They are present in virtually all of our planet's environments, including some of the most extreme, from acidic lakes to the deepest ocean, and from frozen environments to hydrothermal vents.

미생물세포학특론 3 credit

(ADVANCED MICROBIAL CELL BIOLOGY)

Microbial cell biology is an academic discipline that studies microbial cells ？ their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division and death. This is done both on a microscopic and molecular level. Microbial cell biology research encompasses the great diversity of single-celled organisms like bacteria and protozoa.

미생물육종학 3 credit

(MICROBIAL BREEDING)

The goal of this course is to instruct students in the theory and application of classical and molecular genetic analysis of prokaryotic and eukaryotic microorganisms. Case studies will be presented to demonstrate how modern approaches in microbial genetic engineering impact human health and society. Genetic engineering, recombinant DNA technology, genetic modification/manipulation (GM) and gene splicing are terms that apply to the direct manipulation of an organism's genes. Genetic engineering is different from traditional breeding, where the organism's genes are manipulated indirectly. Genetic engineering uses the techniques of molecular cloning and transformation to alter the structure and characteristics of genes directly.

미생물화학 3 credit

(MICROBIAL CHEMISTRY)

This course deals with the conformation and structure of biomacromolecules including nucleic acids (DNA and RNA), proteins, polysaccharides and lipids in biological membranes. The relationship of the protein structure and its function as well as the implication of the double helical structure of DNA to genetics will be

especially stressed in this course.

바이러스학특론 3 credit

(ADVANCED VIROLOGY)

This course will emphasize virus-host interactions at the molecular and cellular levels. The topics will include viral structure, replication, gene expression, and effects of virus infection on cells. The specific viruses will be discussed in detail.

발효학특론 3 credit

(ADVANCED FERMENTATION SCIENCE)

This course includes recent advances and developments in the field of fermentation technology, focusing on industrial applications. The course covers new aspects such as recombinant DNA techniques in the improvement of industrial micro-organisms, and includes comprehensive information on fermentation media, sterilization procedures, inocula, fermenter design, and fermentation economics.

생리활성물질학 3 credit

(BIOLOGICAL ACTIVE SUBSTANCES)

Knowledge of protein structure and function is essential for understanding life.

This course will cover topics on amino acid sequence to structure, structure-function relationship, regulation of protein function, sequence to function: case studies in structural and functional genomics, and structure determination.

생물공학특론 3 credit

(ADVANCED BIOTECHNOLOGY)

Modern biotechnology will be studied including nanobiotechnology, genomics, proteomics, pathway engineering, gene therapy, biowarfare, and bioethics

생물반응기론 3 credit

(BIOREACTOR TECHNOLOGY)

Mathematical modeling for batch, fed-batch, and continuous bioreactor processes will be introduced using differential equations, which will be numerically integrated with an Excel-VBA program. Predictions of enzyme reaction, cell growth, and cellular product from each bioreactor operation will be shown along with the process time.

생물방제학 3 credit

(BIOLOGICAL CONTROL)

Lecture for controlling a disease-causing pathogen or an exotic species by antagonistic microrganisms and controlling pests (including insects, mites, weeds and plant diseases) that relies on predation, antagonism, nutrients competition parasitism, herbivory, or other natural mechanisms.

생물분리학특론 3 credit

(BIOSEPARATION)

Principles of the biological separation processes will be introduced including centrifuge, cell disruption, fractional precipitation, membrane dialysis, ion chromatography, gel chromatography, hydrophobic chromatography, aqueous two-phase separation, etc.

생체막생물학 3 credit

(BIOLOGY OF MEMBRANES)

Course topics will focus on the structure, function, and biosynthesis of biological membranes.

세균학특론 3 credit

(ADVANCED BACTERIOLOGY)

Lecture for a branch of microbiology dealing with the identification, physiology, structure, classification, and cultivation of bacteria and with their applications in medicine, agriculture, industry, and biotechnology.

세포배양론 3 credit

(CULTURE TECHNIQUES OF CELLS)

Recombinant foreign proteins are able to be produced from plant or animal tissue cultures. This course will introduce the principles and applications of plant and animal cell cultures.

식품미생물학특론 3 credit

(ADVANCED FOOD MICROBIOLOGY)

Food microbiology is the study of the microorganisms which inhabit, create or contaminate food. Of major importance is the study of microorganisms causing food spoilage. However "good" bacteria such as probiotics are becoming increasingly important in food science. In addition, microorganisms are essential for the production of foods such as cheese, yoghurt, other fermented foods, bread, beer and wine.

유기합성학 3 credit

(ORGANIC CHEMISTRY)

An introduction of the art and craft of organic synthesis, focusing on concepts, methods, starting materials, and target molecules that play important roles in modern synthesis. Emphasis will be placed on rational design of synthetic routes. Important topics covered are: the basic concept of retrosynthetic analysis, synthon approach and functional group conversions; systematic evaluation of the arrangement of functionality; protection; design and use of selective reagents; control of regio- and stereochemistry.

유전공학특론 3 credit

(ADVANCED GENETIC ENGINEERING)

Course topics will focus on methods in genetic engineering, genomic library, gene cloning, RNAi and antisense RNA, expression vector, and transformation system

천연물유기화학 3 credit

(NATURAL ORGANIC CHEMISTRY)

This course deals with the principles and tools of organic chemistry to understanding the chemical processes and transformations in living organisms. Emphasis is placed on understanding molecular basis for the structure and function of the major chemical components such as cellular components, such as proteins, carbohydrates, lipids, nucleic acids, and other biomolecules in biochemical processes.

토양미생물학 3 credit

(SOIL MICROBIOLOGY)

The study for the functions, ecology, interaction between other microbes, plants or animals, taxonomy of microorganisms (including viruses, bacteria, actinomycetes, fungi, and protozoa) and microbial application for agriculture or environment in the soil environment.

환경미생물학특론 3 credit

(ADVANCED ENVIRONMENTAL MICROBIOLOGY)

Course topics will focus on methods for studying microbial ecology, the role of microbes in air, soil, water, and their application in waste treatment.

생물정보학특론 3 credit

(ADVANCED BIOINFORMATICS)

Course topics will focus on studying internet web sites relevant to DNA, RNA, and Protein bioinformatic tools.