**생 화 학 과**

**(DEPARTMENT OF BIOCHEMISTRY)**

**Department Introduction**

The graduate programs in Biochemistry provide education and training of biochemists interested in living organism ranging from cell to high-levels of organization. Specialty areas of particular strength include cell biology, molecular biology, structure and function of protein, and DNA biochemistry.

**List of Faculty Members**

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| --- | --- | --- | --- | --- |
| Position | Name | Last School Graduated | Degree | Major |
| Professor | Chung, Taeowan | University of  Minnesota, USA | Ph.D | Molecular Biology,  Molecular Genetics |
| Professor | Rhee, Seung Keun | Johns Hopkins Univ., USA | Ph.D | Biochemistry |
| Professor | Lee, Chong-Soon | Univ. of Texas at Austin, USA | Ph.D | Cancer Biochemistry, Molecular Physiology |
| Professor | Yun, Hyungdon | Seoul National Univ., Korea | Ph.D | Protein Engineering |
| Professor | Park, Hyun Ho | Cornell Univ., USA | Ph.D | Protein Structural  Biology |
| Research professor | KHM Nazmul Hussain Nazir | Kyushu University | Ph.D | Biotechnology,  Biochemistry |
| Research professor | Kannan Badri  Narayanan | Pondicherry University | Ph.D | Biotechnology |

**Academic Programs**

Graduate programs are offered leading to the Master of Science and Doctor of Philosophy degrees in Biochemistry.

**Course Description**

■ Basic Major Courses

분자생물학(1) 3 credit

(MOLECULAR BIOLOGY Ⅰ)

Structure, function and biosynthesis of nucleic acids will be covered in this course.

세포생화학특론 3 credit

(ADVANCED CELLULAR BIOCHEMISTRY)

A principal aim of this course is to understand the underlying mechanisms of the common biological processes and the physiological functions performed by various chemical components such as nucleic acid and protein at cellular level. In addition, the relationship between the highly dynamic cell structures and the versatile activities of the cell will be discussed.

효소화학 3 credit

(ENZYME CHEMISTRY)

Enzymes are involved in a variety of chemical reactions in biological systems. They function as catalysts that can increase the rate of the reactions and are very specific for a particular reaction. This course will cover 1. How the enzyme looks like 2, How specific enzyme can get a specificity 3. What are the implications of enzyme malfunctions 4. How enzyme can work on the specific reactions.

■ Major Courses

개별연구(1) 3 credit

(INDEPENDENT STUDY (1))

개별연구(2) 3 credit

(INDEPENDENT STUDY (2))

생화학과세미나 1 credit

(SEMINAR IN BIOCHEMISTRY)

특수문제연구(1) 3 credit

(SPECIAL STUDY(1))

특수문제연구(2) 3 credit

(SPECIAL STUDY(2))

특수문제연구(3) 3 credit

(SPECIAL STUDY(3))

특수문제연구(4) 3 credit

(SPECIAL STUDY(4))

특수문제연구(5) 3 credit

(SPECIAL STUDY(5))

■ 생화학전공(BIOCHEMISTRY)

DNA구조와기능 3 credit

(DNA STRUCTURE AND FUNCTION)

Double-stranded DNA; Triple strand; Quadruple strand; Unusual DNA structures (DNA bending, left-handed Z-DNA, DNA supercoiling, Cruciform structure); Function of Z-DNA in vivo; Antisense DNA; Sequence-specific DNA recognition; DNA-protein interaction.

DNA돌연변이 3 credit

(DNA MUTAGENESIS)

DNA damage; Reaction of directly acting agents with DNA; Metabolic activation of carcinogen and mutagen; Conformation of DNA modified by aromatic carcinogens; Selection of mutant in eukaryote; Ames test and supF gene assay.

DNA복구 3 credit

(DNA REPAIR)

Various kinds of DNA damage and DNA adduct; Nucleotide excision repair; Base excision repair; recombination repair; mismatch repair; repair of double-stranded breaks; Control of DNA repair (SOS repair, adaptive repair); application of ligation-mediated PCR.

단백질의 구조와 기능 3 credit

(STRUCTURE AND FUNCTION OF PROTEIN)

The principal aim of the course is to study about the structure and function of protein which is an essential molecule for the life. It will cover various topics ranging from the 20 kinds of amino acids, structures of protein at various levels, the structure-function relationship, and to the regulatory mechanisms of protein function.

단백질정제 3 credit

(PROTEIN PURIFICATION)

The purpose of this course is to study a wide range of protein fractionation and purification methods, while pointing out the advantages and disadvantages of each, so that a choice can be made to suit the problem appropriately. The traditional procedures such as salt fractionation will be discussed, along with the many modern developments in affinity chromatography and related techniques.

바이오에세이 3 credit

(BIOASSAY)

This course will cover methodological approaches to bioassay development for high throughput screening. Various assay formats, visualization techniques, and current developments in assay technology will be discussed. Both cell-based (cytotoxicity; cytoprotection, high content imaging, and reporter systems) and cell-free assay systems (enzyme, FRET, time resolved fluorescence, quenching assays, and immunological assays) will be included with discussion of the potential promise and pitfalls associated with each assay system.

분석생화학 3 credit

(BIOANALYTICAL CHEMISTRY)

Bioanalytical chemistry is the development and application of chemical measurements and instrumentation to study biochemical and biological problems. This course is designed to survey modern bioanalytical chemistry with specific focus on the physical principles and practical aspects of core and emerging bioanalytical techniques. By the end of this course, you will be able to: 1) identify the most useful technique for a given bioanalytical problem, 2) interpret and use the results from a given bioanalytical technique, 3) understand the physical, chemical and instrumental fundamentals underlying these measurements, and 4) critically assess advances within the field of bioanalytical chemistry.

분자생물학(2) 3 credit

(MOLECULAR BIOLOGY Ⅱ)

This course will focus on the understanding of various control mechanisms of gene expression.

분자생물학특론 3 credit

(ADVANCED MOLECULAR BIOLOGY)

Recent topics on molecular biology and biotechnology will be introduced and discussed in this course.

생체막 3 credit

(BIOMEMBRANES)

The membranes of most living cells are organized to encompass morphologically distinctive organelles with well-defined functions. This course addresses the general structures and functions of mainly mammalian cell membranes. In addition, the isolation and characterization of plant membranes are covered in minor volume.

생체물질의분광분석 3 credit

(SPECTROSCOPIC ANALYSIS OF BIOMOLECULES)

The course aim is to enhance the knowledge in the use and utility of spectroscopic methods in the field of biomolecular analysis. The course will be devoted to the analysis of different classes of biomolecules suitable for spectroscopic technologies. The teaching program will cover fundamental and instrumental aspects, will focus on different applications and strategies for biomolecular analysis as well as data interpretation. The theoretical learning will be completed by a practical part.

생체에너지론 3 credit

(BIOENERGETICS)

The principal aim of this course is to understand the energy involved in making and breaking of chemical bonds in the [molecules](http://en.wikipedia.org/wiki/Molecules) found in biological [organisms](http://en.wikipedia.org/wiki/Organism). The role of energy is fundamental [biological processes](http://en.wikipedia.org/wiki/Biological_process) such as growth, differentiation, and development. The ability of all living organisms to harness energy from a variety of metabolic pathways is discussed in a detail.

생화학특론 3 credit

(ADVANCED BIOCHEMISTRY)

The major theme of this course is to study the elaborate and interdependent control networks of the biological processes, including enzymatic actions in various metabolic pathway and the expression and transmission of genetic information.

유기생화학 3 credit

(BIOORGANIC CHEMISTRY)

The course will present a survey of how the principles of organic chemistry have been applied to understand and exploit biological phenomena and address fundamental questions in life sciences. Covered topics include the design and mechanism of enzyme mimics and small molecule catalysts (organocatalysts), synthesis and chemical modification of biomolecules (oligonucleotides, proteins, oligosaccharides), design and application of oligonucleotide and peptide mimetics, and chemical approaches to proteomic and genetic analyses.

유전공학 3 credit

(GENETIC ENGINEERING)

The modern concept of genetic engineering is the manipulation of genome using various biotechnology. This course will cover from DNA cloning to purification of target proteins. In addition, protein engineering and bioinformatics will be discussed

효소반응메카니즘 3 credit

(MECHANISM OF ENZYME REACTION)

Enzymes increase the rate of chemical reactions by lowering the free energy barrier that separates the reactants and products. This course will cover general properties of enzymes, activation energy and the reaction coordinate and catalytic mechanism. Protease will be introduced for model enzyme to describe all the properties of enzyme.

효소반응속도론 3 credit

(ENZYME REACTION MECHANISM)

Enzymes increase the rate of chemical reactions by lowering the free energy barrier that separates the reactants and products. This course will cover energetic, enzyme specificity, and enzyme rate calculation.

합성생물학 3 credit

(Synthetic Biology)

Synthetic Biology is an emerging technology that hopes to further develop biology as a substrate for engineering by adapting concepts developed in other fields of engineering. This course aims to 1) employ biological parts and processes to design or construct the system that is not existing

in nature and 2) re-design and fabrication of existing biological systems.