**DEPARTMENT OF BIOMEDICAL ENGINEERING**

1. Department

The department of biomedical engineering was established in 1999 as interdepartmental collaboration course of the Graduate School.

The aim of this department is the development of experts who could manage biomedical researches as well as key roles in promoting the biomedical industries. Activating biomedical engineering-related researches in this department would ultimately contribute to the development of domestic medical engineering industries. The courses are introducing the general concepts of biomedical engineering , essential human biology and biotechnology

Faculties from colleges of medicine and engineering are co-participating as lecturers in the related subjects, and supervising the students' researches.

2. List of Fuculty Members

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Position** | **Name** | **Last School Graduated** | **Degree** | **Major** |
| Professor | Ahn, Myun Whan | Kyungpook National University | Ph.D. | Spine Surgery |
| Honorary Professor | Shin, Sei One | Chonbuk National University | Ph.D. | Radiation Oncology |
| Professor | Lee, Joon Ha | Yeungnam University | Ph.D. | Applied Physics |
| Professor | Kim, Jae Hwang | Yeungnam University | Ph.D. | Surgery |
| Professor | Kim, Yong Jin | Kyungpook National University | Ph.D. | Pathology |
| Professor | Jung, Hee Chang | Yeungnam University | Ph.D. | Urology |
| Professor | Moon, Ki Hak | Yeungnam University | Ph.D. | Urology |
| Professor | Yun, Sung Su | Yeungnam University | Ph.D. | Surgery |
| Professor | Ahn, Sang Ho | Kyungpook National University | Ph.D. | Rehabilitation Medicine |
| Associate Professor | Yun, Sang Mo | Kyungpook National University | Ph.D. | Radiation Oncology |
| Professor | Seo, Hee Don | Tohoku University, Japan | Ph.D. | Semiconductor Devices |
| Professor | Kim, Chong Gun | The University of Electro-Communications, Japan | Ph.D. | Computer Network |
| Professor | Kim, Suk Young | University of Vermont, USA | Ph.D. | Biomaterials |
| Professor | Kim, Ki Chai | Keio University, Japan | Ph.D. | Environment Electronics |
| Professor | Chung, Il Sup | Purdue University, USA | Ph.D. | Experimental Mechanics |
| Professor | Lee, Choon Yeol | University of Texas, USA | Ph.D. | Design Engineering |
| Professor | Choi, Soon Don | University of Michigan, USA | Ph.D. | Thermodynamics |
| Exchange Professor | Shin, Hyoun Jin | Yeungnam University | Ph.D. | Biomedical  Engineering |

**Course Description**

■ 기초공통(Basic Major Courses)

생체전자공학특론 3 credit

(ADVANCED BIO-ELECTRONIC ENGINEERING)

This course introduces the various electrical phenomena of bio-signals that occur in a living body. And students must study the measuring method, electronic and systems that process the biological signals. Especially, this course lectures advanced theory of bio-medical engineering, and the application of medical sciences

의공학개론 3 credit

(INTRODUCTION TO MEDICAL ENGINEERING)

Introduction to the general divisions of Medical Engineering. Lectures on basic concepts in technical adaptation of Engineering and in essential physiological phenomena concerning to Medical Engineering.

의용계측개론 3 credit

(INTRODUCTION TO BIOMEDICAL MEASUREMENT)

Fundamental principles in diversion of physical amounts and measuring principles for detection and treatment. How to measure the signals of various Biomedical instruments and devices, data diversion, etc.

의용기기학 3 credit

(MEDICAL INSTRUMENTATION)

Lectures on designing, construction and test of the machinery which can be used directly for clinics as well as for fundamental research in Biomedical Engineering.

의용재료개론 3 credit

(INTRODUCTION TO BIOMEDICAL MATERIALS)

Introduction to various language for biomedical materials. Lectures on the effects of atomic or molecular structure and chemical combination on the characters of materials physically, chemically, mechanically, electronically, optically and biologically.

의학개론 3 credit

(INTRODUCTION TO MEDICAL SCIENCE)

This is an introductory course to general medical science. To understand the general principles of general medicine and treatment, basic anatomy, physiology and pathology will be introduced. The aim of this course is the integration of medicine and engineering.

■ 전공(Major Courses)

개별연구(1) 3 credit

(INDEPENDENT STUDY (1))

개별연구(2) 3 credit

(INDEPENDENT STUDY (2))

특수문제연구(1) 3 credit

(SPECIAL STUDY(1))

특수문제연구(2) 3 credit

(SPECIAL STUDY(2))

의공학과세미나 1 credit

(SEMINAR)

■ 의공학전공(BIOMEDICAL ENGINEERING MAJOR)

내비뇨기과학 3 credit

(ENDOUROLOGY)

디지털신호처리응용 3 credit

(SPECIAL TOPICS ON DIGITAL SIGNAL PROCESSING)

We consider the definitions of continuous-time signals and discrete-time signals and their spectrum representations. It is important to understand the Nyquist sampling theorem especially when the continuous-time signals are sampled to provide discrete-time signals. We also study about the basic definitions and structures of FIR and IIR filters, and their applications to the filter design problems. To understand the spectrum representations,

the Fourier transform, Fourier series, DTFT (Discrete-Time Fourier Transform), and DFT (Discrete Fourier Transform) are studied with a particular emphasis on their inter-relations. Most of the algorithms needed to realize the digital signal processing are implemented using the MATLAB language, and the assoicated results are analyzed.

디지털영상처리 3 credit

(DIGITAL IMAGE PROCESSING)

Lectures on the representations of images, image processing systems, enhancement, morphology, transform coding, image restoration, compression, JPEG, MPEG, region and growing

마이크로컴퓨터설계 3 credit

(DESIGN OF MICROCOMPUTER SYSTEM)

This course covers design of microcomputer system which consists of microprocessor and IO system. We will discuss about pipeline, superscalar and branch prediction to increase performance of microprocessor, and also discuss about PCI and 3GIO(3rd generation IO) to increase performance of IO system.

방사선의 급·만성영향 3 credit

(ACUTE AND LATE EFFECTS OF RADIATION)

This program is designed for those students who wish to pursue a career in radiation oncology. Main objectives of this course are to learn acute effects of total -body irradiation, radiation carcinogenesis, hereditary effects of radiation, effects of radiation on the embryo and fetus, radiation cataractogenesis and radiaton protection.

생체기능대행 3 credit

(ARTIFICIAL THERAPEUTIC AND PROSTHETIC DEVICES)

Mechanism and adaptation of the Artificial Therapeutic and Prosthetic devices such as Heart-lung machine, Ventilator, Hemo-dialyzer, Pacemaker, Defibrillator.

생체신호처리 3 credit

(BIO-SIGNAL PROCESSING)

Introduction of bioelectric phenomena and its mechanism. Lectures on how to measure and treat the signals centering around the induced current of bioelectric signals.

생체역학 3 credit

(BIOMECHANICS)

Understanding of the special characters of Biomechanics. Interpretation of dynamic description and modelling of the motion and transformation of organs caused by power and movement. Analysis on movement of body, usually treated in Rehabilitation Medical science and physiology, based on Mechanical technology.

생체재료 3 credit

(BIOMATERIALS)

This course introduces the fundamental concepts and theories behind the choice of materials (Metals, polymers, ceramics, composites) for biological applications. It brings together biology and materials science to get a better understanding of fundamental interactions that control the applicability of materials. Case studies of present material applications are used to illustrate the principles taught. This course deals mainly the understand the testing, requirements and issues related to medical devices; review current and historic materials used in these medical devices; review current FDA guidelines for medical devices; concern new materials for medical devices.

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Basics of materials for medical applications; criteria for bio-compatible materials and materials selection from various engineering materials- metals, polymers, ceramics, and composites; selected issues for medical device applications, such as reliability, requirements, test methods; state-of-the art of bio-materials; FDA guidelines for medical devices; new materials for medical devices; case studies.

생체적합성 3 credit

(BIOLOGICAL COMPATIBILITY)

- Methodology of biological compatibility investigation on diverse medicines and implements before practically used

- Lectures on legal issues on biological compatibility in order to prepare for pragmatic uses of medical engineering

센서및엑츄에이터 3 credit

(SENSORS AND ACTUATORS)

Sensors and Actuators are very important systems to catch and analyze physical, chemical and biological informations. Recently,

IT(Information Technology) and

BT(Bio-Technology) accelerate the

development of a various of sensors and

actuators. The aim of this course is to provide an understanding of fundamental principles and applications of sensors and actuators. Topics are the kind of sensors, characteristics, applications for sensors; the kind of actuators, mechanism and applications for actuators.

요로촬영술3 credit

(IMAGING OF THE URINARY TRACT)

운동기능의신경생리 3 credit

(NEUROPHYSIOLOGY OF MOTOR FUNCTION)

Some recovery of motor function takes place after a CNS lesion. We will explore the neural mechanisms that are or may be related to such recovery and emphasizes data that are particularly important to an understanding of physiological mechanisms of recovery of function and to the role of rehabilitation in obtaining the maximum possible recovery

유한요소법 3 credit

(FINITE ELEMENT METHOD)

This course consists of lectures on basic theories of Finite Element Method including truss, beam, plane stress(strain), plate(shell) and 3-D problems. It also provides instruction on how to use commercial FEM programs and applications to practical problems by term projects.

의용방사선특론 3 credit

(ADVANCED BIO-MEDICAL RADIOLOGY)

Lecture on basic concepts of Radiation and Physical knowledge about radiation applied to diagnosis and treatment. Study on subject concerning to Radio-graphic image headed by Angio-graphy, CT image

의용센서이론 3 credit

(BIOMEDICAL SENSOR THEORY)

About the operation principle and system of all sort of biomedical sensors. Lectures on the characteristics of physical amount generated inside body such as blood pressure, blood flow, ECG, EEG, etc. and on the suitable sensors to each occasions. Lectures on the methods of generation, detection or measurement of X-ray, ultrasound, electromagnetic wave and so on practically adapted to various biomedical machinery for the purpose of medical treatment

의용영상처리 3 credit

(MEDICAL IMAGE PROCESSING)

Diverse theories on image signal processing and archiving, compression for store and transportation of medical image, having been increased its relative importance in medical science as a diagnostic devices. Fundamental theory on system construction requisite to tele-medical system.

재활공학 3 credit

(REHABILITATION ENGINEERING)

Lectures on an outline of Rehabilitation Engineering, a grounding in many kinds of medical treatment for rehabilitation and study on practical application of Biomedical Engineering to this field and on the real situation, so as to place the firm base of improvement or development of various equipment for rehabilitation treatment as well as diagnosis.

재활의학특강 3 credit

(ADVANCED TOPICS ON REHABILITATION)

Rehabilitation should be comprehensive and include prevention, early recognition, and outpatient, inpatient, and extended care programs. Anticipated patient outcomes of such a comprehensive and integrated rehabilitation program should include increased independence, a shortened length of stay, and an improved quality of life.

전기생리학 3 credit

(ELECTROPHYSIOLOGY)

Explanation of the principles in electro-physiology and discussions on how the changes of electro-phenomena can be used for the communication among cells. Lecture on the role of action potential, the mechanism of cell membrane potential and ion-channel theory of cell membrane, etc.

전자장론 3 credit

(ELECTROMAGNETIC FIELD THOERY)

Goals, To provide the student with a basic background on electromagnetics and the understanding of what electromagnetic waves, scattering and differaction.

Topics,

- Maxwell Equations

- The Basics of Electomagnetic Wave

- Wave Scattering and Differaction

- Solutions of Wave Equation

전자파와생체 3 credit

(BIOLOGICAL EFFECT OF ELECTROMAGNETIC WAVES)

Electromagnetic waves are widely used in the present. This lecture deals with the biological effect of electromagnetic waves.

전자파해석특론 3 credit

(ADVANCED ANALYSIS OF ELECTROMAGNETIC WAVES)

Goals, To provide the student with an understanding of recent methods for analysis of Electromagnetics, and how they are used in the analysis of electromagnetics.

Topics,

- recent techniques for EM wave analysis.

- state-of-art numerical method

전자회로설계 3 credit

(DESIGN OF ELECTRONIC CIRCUITS)

This course covers analysis and design of electronic circuits using BJT and CMOS. We will discuss about DC bias circuit and AC model, and also discuss about design of amplifier.

정신성의학 3 credit

(SEXUAL THERAPY)

조직공학 3 credit

(TISSUE ENGINEERING)

<의학과 해부학전공>

Tissue engineering generally combines three key elements: scaffolds (matrics), signaling molecules (growth factors), and cells. By combining these element, regeneration of damaged tissue and restoration or improvement of organic function can often be accomplished.

<의공학과>

Lectures on basic concepts, principles and fundamintals of Tissue Engineering and cell-culture for producting more tissues.

Understanding of various clinical knowledge and characteristics of tissue required for clinical application of tissue engineering. Lectures on progressive theories aiming at developing original technique and at expediting future research on tissue engineering.

종양핵의학 3 credit

(NUCLEAR MEDICINE FOR ONCOLOGY)

This program is designed for those students who wish to pursue a career in radiation oncology. Main objectives of this course are to learn radiophamaceuticals and instrumentation for cancer imaging, quality assurance and quality control, clinical applications for specific organs, and other recent useful procedures and new technology including PET for oncological practices.

의학과 핵의학전공(2006-1)

This subject is about radiopharmaceuticals of cancer imaging, parathryoid imaging, gallium and thallium scintigraphy in tumor diagnosis, use of sentinel node imaging in surgical oncology and role of radiolabeled antibodies.

행동과학 3 credit

(BEHAVIOR SCIENCE)