

Department of Bioengineering

I. Educational Objectives

The Department of Bioengineering aims to educate and train professionals equipped with knowledge in medicine, basic sciences, and various engineering disciplines, enabling them to lead the future advanced medical science and healthcare industries.

II. Academic Fields (Majors)

- Bioengineering

III. Departmental Regulations

1. Course Requirements

Courses offered by the Department of Bioengineering are classified into two categories: Basic Common Courses and Major Courses. All graduate students must satisfy the following requirements to obtain their degree.

1. Students must complete a designated number of Basic Common Courses:
 - Master's Program: 1 course
 - Doctoral Program: 2 courses
 - Integrated Master's–Doctoral Program: 2 courses
2. Major courses offered by other departments may be recognized as major courses upon approval by both the academic advisor and the department chair.
3. Students who have completed the required Basic Common Course(s) during their master's program and subsequently enter the doctoral program shall be deemed to have fulfilled the Basic Common Course requirement. In addition, they must complete at least 18 credits from courses offered by the Department of Bioengineering among the credits required for degree completion.

The Basic Common Courses and Major Courses are as follows:

I. Basic Common Courses

- Clinical Rotation, Experimentation, Biomedical Engineering Colloquium I, Biomedical Engineering Colloquium II, Biomedical Engineering Colloquium III, Biomedical Engineering Colloquium IV, Advanced Optics Theory, Micron-Scale Optical Applications in Biology, Plasmonics, Radiation Detection and Measurement I, Medical Imaging System, Pattern Recognition and Machine Learning, Advanced Radiological Physics, Medical Imaging Devices, Numerical Analysis, Medical Implant, Tissue Engineering and Regenerative Medicine, Biomedical Materials and

Biocompatibility, Introduction to Nanomedicine, Biomedical Scaffold, Biochip, Amplifier Design for Medical Instrumentation, and Microfabrication Technology.

II. Major Courses

- Interferometric Imaging, Light-Tissue Interaction, Biophotonics, Special Topics in Biophotonics I, Special Topics in Biophotonics II, Molecular Spectroscopy, Advanced Computer Programming, Computational Neuroimage Analysis, Image Reconstruction Algorithms, Radiation Detection and Measurement II, Treatment Planning of Radiotherapy and Practice, Radiation Therapy Physics, Quality Assurance of Radiotherapy and Practice, Cancer Therapy Technique, X-Ray and Gamma-Ray Imaging, Introduction to Nuclear Medicine Physics, Particle Therapy, Polymers in Biomaterials, Analysis Techniques for Biomaterials, Surface Treatment of Biomaterials, Cancer Biology, Biomedical Cell Biology, Recent Advances in Nanobiotechnology, Biomedical 3D Printing, Nanofabrication, Microfluidics Theory and Application I, Microfluidics Theory and Application II, Nanoscale Characterization of Biomaterials, System Design for Biochemical Analysis, Next Generation Biochemical Analysis, Digital System Control for Medical Instrumentation, Review of Edge Biomedical Technology I, Review of Edge Biomedical Technology II, Bioresorbable Materials and Applications, Biomedical Engineering Practicum I, Biomedical Engineering Practicum II, and Artificial Organs.

2. Credit Requirements

Graduate students in the Department of Bioengineering must complete a minimum number of credits through courses offered within the department, according to their degree program. However, courses taken in the Department of Integrated Biomedical and Life Sciences, the Department of Health Sciences, the Interdisciplinary Program in Bio-Micro Systems Technology, the Department of IT Convergence Engineering, the Interdisciplinary Program in Global Health, and the Major in Precision Health Science Convergence may, upon approval of the academic advisor, be recognized as Basic Common Courses or Major Courses within the Department of Bioengineering.

The minimum number of credits required for degree completion and the minimum number of credits that must be earned through courses offered within the department are as follows:

- 1) Master's Program: Of the 24 credits required for degree completion, at least 14 credits must be earned through courses offered within the department.
- 2) Doctoral Program: Of the 30 credits required for degree completion, at least 18 credits must be earned through courses offered within the department.
- 3) Integrated Master's–Doctoral Program: Of the 48 credits required for degree completion, at least 27 credits must be earned through courses offered within the department.

3. Degree Qualification Requirements

(1) Master's Program

Students are, in principle, required to publish at least one paper in a domestic or international academic journal or present at least one paper at an academic conference as the first author.

(2) Doctoral Program and Integrated Master's–Doctoral Program

Students must publish at least two SCI(E)-indexed papers as the first author. Accepted papers are also recognized.

4. Advisor-Designated Courses

Upon admission, students must consult with their academic advisor before the start of the semester to determine designated undergraduate courses or graduate courses (for doctoral students). These courses must be approved by both the academic advisor and the department chair, and all designated courses must be completed.

5. Comprehensive Examination

Students shall take the comprehensive examination as designated by their academic advisor and approved by the department chair.

- 1) Students must have completed the relevant course before taking the examination.
- 2) Master's Program: Two subjects selected from Basic Common and Major Courses, including at least one Basic Common Course.
- 3) Doctoral Program and Integrated Master's–Doctoral Program: Four subjects selected from Basic Common and Major Courses, including at least one Basic Common Course.
- 4) Students who fail may retake only the failed subject(s) in the following semester.
- 5) Courses recognized from other departments may not be used for the comprehensive examination.
- 6) The following courses are exempt from the Comprehensive Examination: Clinical Rotation, Experimentation, and Biomedical Engineering Colloquium I–IV.
- 7) Courses selected for the comprehensive examination must be offered by full-time faculty members. *These regulations shall take effect on September 1, 2025.*

6. Academic Advisors

Upon admission, the dean of the affiliated college shall appoint an academic advisor in consideration of the student's preference.

- **Advisor Qualifications:** Faculty members of this university who have published at least one paper as a primary author or corresponding author in an SCI-level international journal, National Research Foundation of Korea (NRF) indexed journal, or candidate journal (non-natural sciences) within the 3 years preceding the appointment date.

7. Transitional Provisions

- ①. Students from the Department of Health Sciences whose affiliation changed to the Department of Bio-Convergence Engineering on March 1, 2013, shall be subject to the regulations of the Department of Health Sciences. However, they may choose to follow the regulations of the Department of Bio-Convergence Engineering. Previously earned major credits in the Department of Health Sciences shall be recognized as major credits in the Department of Bio-Convergence Engineering. Students who convert to the integrated master's–doctoral program may obtain their degree by completing the total credits required for graduation and satisfying the doctoral comprehensive examination requirements of the Department of Health Sciences, regardless of the mandatory course requirements of the Department of Bio-Convergence Engineering.
- ②. Article 1(3) of these revised regulations shall apply to students admitted on or after March 1, 2015.
- ③. The revised provisions regarding the comprehensive examination shall apply to students admitted on or after September 1, 2016. Students admitted before March 1, 2016, may choose either the revised regulations or the previous regulations after consultation with their academic advisor.
- ④. The revised provisions regarding course requirements shall apply to students admitted on or after March 1, 2013.
- ⑤. Major courses completed in the Department of Health and Safety Convergence Science by students supervised by participating faculty members of that department shall be recognized as major credits in the Department of Bio-Convergence Engineering (Bioengineering).
- ⑥. The revised provisions regarding credit requirements shall apply to students admitted on or after March 1, 2021.
- ⑦. Courses designated as Basic (Common) Courses under either the current or previous regulations shall be recognized as Basic (Common) Courses under all versions of the regulations.

- ⑧. Article 5(1) regarding comprehensive examination requirements shall apply to students admitted on or after March 1, 2023.

IV. Courses Offered by the Department of Bioengineering

IV. Course Curriculum Table

Classification	Course Code	Course Title (English Verbatim / Translation)	Credits (Hours)
Basic Common	HBL516	Biomedical Imaging	3(3)
Basic Common	HBL01	EXPERIMENTATION	3(3)
Basic Common	HBL502	CLINICAL ROTATION	3(3)
Basic Common	HBL601	ADVANCED OPTICS THEORY	3(3)
Basic Common	HBL553	MICRON-SCALE OPTICAL APPLICATIONS IN BIOLOGY	3(3)
Basic Common	HBL712	PLASMONICS	3(3)
Basic Common	HBL713	RADIATION DETECTION AND MEASUREMENT I	3(3)
Basic Common	HBL571	MEDICAL IMAGING SYSTEM	3(3)
Basic Common	HBL556	PATTERN RECOGNITION AND MACHINE LEARNING	3(3)
Basic Common	HBL568	ADVANCED RADIOLOGICAL PHYSICS	3(3)
Basic Common	HBL559	MEDICAL IMAGING DEVICES	3(3)

Basic Common	HBL551	NUMERICAL ANALYSIS	3(3)
Basic Common	HBL697	TISSUE ENGINEERING AND REGENERATIVE MEDICINE	3(3)
Basic Common	HBL707	BIOMEDICAL MATERIALS AND BIOCOMPATIBILITY	3(3)
Basic Common	HBL705	INTRODUCTION TO NANOMEDICINE	3(3)
Basic Common	HBL710	BIOCHIP	3(3)
Basic Common	HBL708	AMPLIFIER DESIGN FOR MEDICAL INSTRUMENTATION	3(3)
Basic Common	HBL691	MICROFABRICATION TECHNOLOGY	3(3)
Basic Common	HBL510	Biomedical Engineering Colloquium I	3(3)
Basic Common	HBL511	Biomedical Engineering Colloquium II	3(3)
Basic Common	HBL512	Biomedical Engineering Colloquium III	3(3)
Basic Common	HBL513	Biomedical Engineering Colloquium IV	3(3)
Basic Common	HBL720	MEDICAL IMPLANT	3(3)
Basic Common	HBL721	BIOMEDICAL SCAFFOLD (Biomedical Scaffold Processing)	3(3)
Major	HBL828	Advanced Drug Delivery System	3(3)
Major	HBL690	INTERFEROMETRIC IMAGING	3(3)
Major	HBL702	LIGHT-TISSUE INTERACTION	3(3)
Major	HBL687	SPECIAL TOPICS IN BIOPHOTONICS I	3(3)

Major	HBL688	SPECIAL TOPICS IN BIOPHOTONICS II	3(3)
Major	HBL711	MOLECULAR SPECTROSCOPY	3(3)
Major	HBL552	ADVANCED COMPUTER PROGRAMMING	3(3)
Major	HBL555	COMPUTATIONAL NEUROIMAGE ANALYSIS	3(3)
Major	HBL576	IMAGE RECONSTRUCTION ALGORITHMS	3(3)
Major	HBL714	RADIATION DETECTION AND MEASUREMENT II	3(3)
Major	HBL689	TREATMENT PLANNING OF RADIOTHERAPY AND PRACTICE	3(3)
Major	HBL574	RADIATION THERAPY PHYSICS	3(3)
Major	HBL821	QUALITY ASSURANCE OF RADIOTHERAPY AND PRACTICE	3(3)
Major	HBL575	CANCER THERAPY TECHNIQUE	3(3)
Major	HBL577	X-RAY AND GAMMA-RAY IMAGING	3(3)
Major	HBL715	INTRODUCTION TO NUCLEAR MEDICINE PHYSICS	3(3)
Major	HBL822	PARTICLE THERAPY	3(3)
Major	HBL699	POLYMERS IN BIOMATERIALS	3(3)
Major	HBL562	ANALYSIS TECHNIQUES FOR BIOMATERIALS	3(3)
Major	HBL698	SURFACE TREATMENT OF BIOMATERIALS	3(3)
Major	HBL684	CANCER BIOLOGY	3(3)
Major	HBL686	RECENT ADVANCES IN NANOBIO TECHNOLOGY	3(3)
Major	HBL567	ARTIFICIAL ORGANS	3(3)
Major	HBL695	NANOFABRICATION	3(3)
Major	HBL825	MICROFLUIDICS THEORY AND APPLICATION I	3(3)

Major	HBL826	MICROFLUIDICS THEORY AND APPLICATION II	3(3)
Major	HBL683	NANOSCALE CHARACTERIZATION OF BIOMATERIALS	3(3)
Major	HBL680	SYSTEM DESIGN FOR BIOCHEMICAL ANALYSIS	3(3)
Major	HBL605	NEXT GENERATION BIOCHEMICAL ANALYSIS	3(3)
Major	HBL554	DIGITAL SYSTEM CONTROL FOR MEDICAL INSTRUMENTATION	3(3)
Major	HBL681	REVIEW OF EDGE BIOMEDICAL TECHNOLOGY I	3(3)
Major	HBL682	REVIEW OF EDGE BIOMEDICAL TECHNOLOGY II	3(3)
Major	HBL722	Biophotonics	3(3)
Major	HBL723	Biomedical cell biology	3(3)
Major	HBL724	Biomedical 3D Printing (Biomedical 3D Printing Technology)	3(3)
Major	HBL725	Bioresorbable Materials and Applications	3(3)
Major	HBL726	Biomedical Engineering Practicum I	3(3)
Major	HBL727	Biomedical Engineering Practicum II	3(3)