

Department of Integrated Biomedical and Life Sciences

I. Educational Objectives

The Department of Integrated Biomedical and Life Sciences aims to promote health and improve quality of life by integrating Biofood and Medical Science with Biomedical Science. Its educational objective is to cultivate professionals who can acquire, apply, and utilize advanced knowledge and research capabilities in these fields.

II. Academic Fields (Majors)

- Major in Biofood and Medical Science
- Major in Biomedical Science

III. Departmental Regulations

1. Master's Program

- 1) Courses shall be selected under the guidance of the academic advisor and approved by the department chair. Of the 24 credits required for the degree, at least 15 credits must be completed in major courses offered by the department.
- 2) Courses from other departments may be recognized as major courses with the approval of the academic advisor and department chair. (Courses completed in another specialization within the department are also recognized as major courses.)
- 3) Students are, in principle, required to publish at least one paper in a domestic or international academic journal (co-authorship accepted) or present at least one paper at an academic conference (only presentations by the corresponding/lead presenter are recognized).
- 4) The author's affiliation in published papers or conference presentations must include Korea University. Only papers whose publication acceptance date falls within the student's period of enrollment will be recognized.

2. Doctoral Program

- 1) Courses shall be selected under the guidance of the academic advisor and approved by the department chair. Of the 30 credits required for the degree, at least 20 credits must be completed in major courses designated by the academic advisor and offered by the department.
- 2) Courses from other departments may be recognized as major courses with the approval of the academic advisor and department chair. (Courses completed in another specialization within the department are also recognized as major courses.)
- 3) Students are, in principle, required to publish at least two papers in SCI-indexed international journals. Only corresponding authors, first authors, and verifiable co-corresponding authors are recognized. Accepted papers are also eligible.

Recognition as a corresponding author is limited to one person per paper. Other matters shall follow Korea University's regulations on research achievements.

- 4) The author's affiliation in published papers must include Korea University. Only papers whose publication acceptance date falls within the student's period of enrollment will be recognized. Other matters shall follow Korea University's regulations on research achievements.

3. Integrated Master's–Doctoral Program

- 1) Courses shall be selected under the guidance of the academic advisor and approved by the department chair. Of the 48 credits required for the degree, at least 27 credits must be completed in major courses designated by the academic advisor and offered by the department.
- 2) All other requirements shall follow those of the doctoral program.

4. Advisor-Designated Courses

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

5. Appointment of Academic Advisors

Upon admission, an academic advisor shall be appointed in consideration of the student's preferences according to the following criteria:

- 1) Faculty members of Korea University who have published at least one paper as first author or corresponding author within the three years preceding appointment in an SCI-indexed international journal or a journal registered (or candidate for registration) with the National Research Foundation of Korea (for non-natural science fields).
- 2) The Biofood and Medical Science major and Biomedical Science major shall follow the standards applied to natural science disciplines.

6. Comprehensive Examination

- 1) With approval from the department chair, master's students shall take examinations in two major subjects designated by their advisor, while doctoral and integrated master's–doctoral students shall take examinations in four subjects. Students who fail the comprehensive examination must retake either the failed subject(s) or all examination subjects in the following semester.
- 2) Subjects selected for the comprehensive examination must be courses offered by full-time faculty members. This regulation shall take effect on September 1, 2025.

7. Supplementary Provisions

- ①. Students from the former majors in Health and Nutrition Science and Clinical Laboratory Science within the Department of Health Science who transferred to the Department of Integrated Biomedical and Life Sciences on March 1, 2013, shall have previously earned major credits recognized as credits within the Department of Integrated Biomedical and Life Sciences.
- ②. Students who were admitted to the Department of Integrated Biomedical and Life Sciences and later transferred to the Department of Health Science under the BK21 Plus Program shall have previously earned major credits in the Department of Health Science recognized as major credits in the Department of Integrated Biomedical and Life Sciences upon retransfer.

Transitional Provisions

Article 1(2) of the Master's Program and Article 2(2) of the Doctoral Program apply to students admitted on or after March 1, 2012.

Article 2(3) of the Doctoral Program applies to students admitted on or after March 1, 2012.

Major courses in the Department of Health and Safety Convergence Science completed by students supervised by participating faculty members of that department shall be recognized as major courses in the Department of Integrated Biomedical and Life Sciences.

Article 1(4) of the Master's Program and Article 2(4) of the Doctoral Program apply to students expected to graduate in the second semester of 2019 or later.

Article 2(1) of the Doctoral Program and Article 3(1) of the Integrated Master's-Doctoral Program apply to students admitted on or after March 1, 2021.

IV. Courses Offered by the Department of Integrated Biomedical and Life Sciences

- 1) Major in Biofood and Medical Science
 - **HIL632 Assessment of Nutritional Status [3]** Directly measures subjects' anthropometrics, biochemical status of body composition, clinical status, and dietary intake to assess physical nutritional status, allowing students to compare and verify results.
 - **HEL636 Cultural Aspects of Food [3]** Studies the uniqueness and characteristics of food and dietary cultures in relation to the culinary cultures of various countries.
 - **HIL637 Physical Chemistry of Food [3]** Covers recent information regarding the physicochemical properties of food components.

- **HIL638 Lipid Chemistry [3]** Teaches the fundamental areas regarding the structure and physicochemical characteristics of lipids.
- **HIL640 Food Safety and HACCP [3]** Covers theories of food safety and practical applications of HACCP, including food safety evaluation methods, Risk Analysis methods to secure food safety, analysis of the 7 basic principles for HACCP introduction, and HACCP design.
- **HIL641 Data Analysis in Food and Nutrition [3]** Identifies the meaning and scope of utilization of health statistics indicators and data generated in food-related fields. Cultivates the ability to effectively conduct public health research by understanding theories and methods applied to each health science field.
- **HIL642 Food Instrumental Analysis [3]** Teaches the direction of analyzing food components, the principles and applications of various analytical instruments, and the interpretation of analytical results.
- **HIL643 Food Immunology [3]** An academic field dealing with the effects of food components on the immune system; lectures on immune concepts and immune system interactions, and identifies the correlation between food and immunity.
- **HIL644 Lipid Metabolism [3]** Studies lipid metabolism within the body and researches/discusses the latest findings on lipid metabolism-related diseases.
- **HIL645 Medical Nutrition Therapy in Metabolic Diseases [3]** Teaches physiological and pathological theories of metabolic diseases and systematically covers clinical nutrition therapy methods tailored to each disease.
- **HIL646 Nutrigenomics [3]** Studies the interaction between nutrient metabolism and genes in vivo, and researches the latest findings in clinical applications such as disease prevention and treatment.
- **HIL647 Food and Nutraceuticals [3]** Promotes an understanding of the types and efficacies of materials with physiological regulatory functions among food components, bioactivity application technologies for product development and production using them, and bioactivity measurement methods.
- **HIL648 New Food Materials and Biomaterials [3]** Studies the characteristics and utilization methods of food materials actually used in industrial fields and newly spotlighted food materials.
- **HIL649 Nutrition Biochemistry [3]** Lectures on the chemical transformation processes and effects of digestion, absorption, and metabolism of nutrients—carbohydrates, lipids, proteins, vitamins, and minerals—in the body, with direct experimentation to compare and observe biological responses to unbalanced diets.
- **HIL650 Sports Nutrition [3]** Provides lectures and discussions on the relationship between health and nutrition for the general public, including lifestyle-related diseases, aging, and weight control, as well as nutritional guidelines to improve athletes' performance.
- **HIL653 Sports Physiology [3]** Lectures and discusses the general theory of human physiology along with the physiological changes and adaptation processes of the body during scenarios like sports activities.

- **HIL839 Special Topics in Food Safety [3]** Teaches biological hazards, chemical hazards, and etiological characteristics related to food hygiene, and researches the development process and latest trends in food hygiene technology to provide specialized knowledge on detection methods and control technologies for food hazards.
- **HIL840 Special Topics in Food Microbiology [3]** Deals with microflora changes during the manufacture, storage, and consumption of food using microorganisms, food spoilage, and microbiological characteristics related to hygiene, alongside recent research trends.
- **HIL880 Seminar in Trans-disciplinary Approaches to Public Health Science Research [2]** Acquires the latest trends in public health biomedical research through special lectures and discussions, teaches the theory and practice of trans-disciplinary integrated public health biomedical research, and qualitatively develops students' own research topics and contents.
- **HIL881 Advanced Nutrition Physiology [3]** Aims to understand mechanisms through which nutrients comprehensively exhibit physiological functions in the human body; lectures on principles and abnormalities of substance transport, body fluids, digestion and absorption, blood, hormones, and exercise, alongside presentations and discussions on recent research papers.
- **HIL882 Current Topics in Nutrition Science [3]** Summarizes literature, presents, and discusses nutrition-related issues that have relatively high interest and frequency in recent academic journals.
- **HIL884 Fermented Foods [3]** Understand the principles and mechanisms by which food materials from various ingredients are manufactured into fermented foods through microbial metabolic processes, and researches the functionality and industrialization processes of traditional fermented foods.
- **HIL885 Experimental Cookery using Oriental Herbs [3]** Researches the understanding of medicinal foods (Yakseon) and the application of traditional biological resources properly blended into cooking, studies cooking methods with enhanced functionality, and develops new menus through various experimental cooking sessions.
- **HIL886 Food and Spatial Aesthetics [3]** Based on overall knowledge of food culture and cooking combined with artistic sensibility, students learn menu composition, dish and product development, table and dining space arrangement, and cultivate creative abilities.
- **HIL889 Advanced Food Hygiene [3]** Teaches biological hazards, chemical hazards, and etiological characteristics related to food hygiene, and researches the development process and latest trends in food hygiene technology to provide specialized knowledge on detection methods and control technologies for food hazards.
- **HIL890 Microbial Toxicology [3]** Studies the characteristics, physiology, toxin production conditions, and environmental factors of endotoxins, exotoxins, and

mycotoxins produced by microorganisms, and helps students acquire and understand related knowledge on preventing and controlling their generation.

- **HIL891 Food Enzymology [3]** Lectures on reaction mechanisms, enzyme production, and industrial applications, centering on enzymes used in food.
- **HIL892 Methods in Nutrition Research [3]** Teaches research design methods and experimental methods necessary to conduct research in the field of nutrition, and helps students acquire basic research methods related to the interpretation and evaluation of results.
- **HIL893 Trend of Biotechnology and Food Industry [3]** Provides knowledge on trends in food-related manufacturing/distribution/foodservice industries, including new technologies in the food biotechnology industry, technology development trends, market outlooks, and analysis.
- **HIL894 Aging Nutrition [3]** Studies the mechanisms of the aging process and the changes and interactions between aging and nutritional components.
- **HIL895 Nutritional Epidemiology [3]** Lectures on methodologies related to nutritional status assessment in research such as clinical nutrition, community nutrition, and nutrition education. Provides overall lectures on nutrition surveillance, nutrition assessment techniques, and experimental design, including data collection and analysis.
- **HIL896 Research in Traditional Food [3]** Historically and scientifically re-examines the recipes of Korea's unique traditional foods, and studies and compares them in relation to modern dietary life.
- **HIL897 Advanced Food Processing and Biotechnology [3]** Covers the field of food science, which explores various problems occurring in food development, production, and supply, as well as the production and utilization of biomaterials through fermentation, enzyme, and genetic engineering techniques.
- **HIL898 Lipid Biotechnology [3]** Studies enzyme-mediated lipid transformation, structured lipid synthesis, biodiesel synthesis, special lipid synthesis, and bioconversion of functional lipids.
- **HIL1631 Topics in Advanced Experimental Cookery [3]** Researches rational cooking processes based on scientific theories regarding food.
- **HIL1633 Industrial Microbiology [3]** Broadens knowledge and understanding of relevant microorganisms used in the food fermentation industry and biotechnology fields, understands the basic theories of fermentation and biological processes, and researches their applications.
- **HIL1635 Vitamin and Mineral [3]** Studies the types and functions of vitamins and minerals, which are essential components in the human body.

2) Major in Biomedical Science

- **HIL553 Bacterial Genetics [3]** Lectures on microbial gene structure, expression regulation, and genetic characteristics.

- **HIL560 Methodology of Genetic Engineering [3]** Lectures and discusses the principles, methods, and application fields of various genetic engineering techniques used in the biotechnology field.
- **HIL562 Chemistry of Biomolecules [3]** Lectures on the characteristics and biochemical functions of bioactive substances related to biotechnology, synthesis and functional improvement methods using microorganisms, and various application fields.
- **HIL567 Special Topics in Intestinal Microorganisms [3]** Examines the composition of complex microbial communities residing in the intestine and their relationship with the human host, and studies the effects of intestinal microorganisms on host health and disease.
- **HIL568 Seminar in Bio-medicinal Science I [3]** Invited speakers in the field of biomedical science introduce the latest research trends to students.
- **HIL569 Advanced Public Health Microbiology [3]** Deeply studies the properties, distribution, mutation, and disease characteristics of causative bacteria for public health-important microorganisms. Examines current biological research trends aimed at prevention and response according to the characteristics of each microorganism.
- **HIL572 Advanced Bacteriology [3]** Understands the evolutionary relationships and diversity of bacteria from molecular genetic and physiological/biochemical perspectives. Based on this, students acquire research methodologies such as pathogenic microbial identification and DNA fingerprinting, and learn principles and methods for molecular phylogenetic analysis of nucleic acid and protein sequences.
- **HIL574 Experimental Methodology of Brain Science [3]** Teaches the principles of and provides practice for various experimental methods (molecular biological, biochemical, cell biological, and electrophysiological experimental methods) used to study brain function.
- **HIL651 Advanced Neuroscience [3]** Acquires molecular-level mechanisms and research methods through which neurons receive information from the outside—such as neurotransmitters, hormones, and growth factors—into the cell interior to respond.
- **HIL803 Topics in Microbiology Research [3]** Introduces and discusses the latest trends and research methods in microbiology research.
- **HIL805 Molecular Basis of Infectious Disease [3]** Lectures on the pathogenesis of infectious diseases caused by microorganisms and host defense mechanisms.
- **HIL807 Introduction to Antibiotics [3]** Lectures on mechanisms of action, resistance mechanisms, and research into new antibiotic development.

- **HIL810 Developmental Biology [3]** Discusses human prenatal development at the cellular level; lectures on the formation and development of cells, tissues, and organs necessary for future cell therapy research.
- **HIL811 Stem Cell Therapy [3]** Lectures and discusses specific cell development, pathogenesis of diseases, and treatments using stem cells.
- **HIL812 Advanced Molecular Biology [3]** Discusses the understanding of gene regulation mechanisms within cells and the application of modern molecular biology techniques.
- **HIL813 Gene Therapy [3]** Lectures on the possibilities of disease treatment by introducing major genes or inhibitory factors into various viral systems (Lentivirus, Retrovirus, Adeno-associated virus, etc.).
- **HIL815 Special Topics in Antibody Engineering [3]** Lectures on antibody production techniques for research, diagnosis, and treatment, alongside antibody engineering techniques for functional improvement. Teaches technologies related to antibody production and recent research trends in disease diagnosis and treatment fields.
- **HIL816 Special Topics in Medicinal Natural Products Biosynthesis [3]** Provides a comprehensive introduction and covers recent research trends regarding the understanding and engineering of biosynthetic pathways of pharmacologically active natural products utilized as pharmaceuticals, functional cosmetics, and health functional foods.
- **HIL817 Glial Neurobiology [3]** Brain cells can be largely divided into neurons and glial cells. For a comprehensive understanding of brain function, this course utilizes recently published research papers to study the physiological and pathological functions of glial cells.
- **HIL821 Bioinformatics [3]** Bioinformatics deals with the storage, retrieval, and analysis of large-scale biological data, such as nucleic acid and protein sequences. This course teaches concepts and analytical methods needed for bioinformatics, paired with Java-based programming practices so researchers can process biological information independently.
- **HIL822 Special Topics in Bio-Catalysts [3]** Provides a comprehensive introduction and covers recent research trends regarding the understanding and engineering of biocatalysts, which are essential for various bio-industrial needs like materials/fine chemical products, high-value pharmaceuticals, and pharmacologically active materials.

- **HIL823 Phylogenetics [3]** Understands the basic concepts of phylogenetics and provides practical training to uncover evolutionary relationships among microorganisms by analyzing omics data molecular-phylogenetically.
- **HIL824 Seminar in Bio-medicinal Science II [3]** Invited speakers in the field of biomedical science introduce the latest research trends to students.
- **HIL825 Microbial Systems Biology [3]** Microbiology is facing a new phase with recent technology developments that enable system-level research. This course studies microbial systems biology research achievements related to human health and disease through recent papers.
- **HIL826 Biomedical Microbiology [3]** Antibiotics have protected human health from infectious diseases caused by pathogenic microorganisms. However, side effects caused by recent antibiotic use are rising drastically. This course studies the effects of antibiotics on pathogenic and gut microbiota, and the resulting impact on human health through recent papers.
- **HIL827 Biology of Human-Microbe Interactions [3]** Humans are symbionts with microorganisms. As it is revealed that these symbiotic microorganisms (human microbiome) play critical roles in human development and physiological activities, the paradigm of modern medical science is shifting. This course studies various interactions between the human microbiome and the human body through recent papers.
- **HIL828 Biomedical Bacterial Physiology [3]** Humans face continuous threats from external pathogenic bacteria but also receive extensive survival assistance from internal beneficial bacteria. This course studies various physiological functions of bacteria directly involved in human health and disease through recent papers.
- **HIL829 Advanced Genetics [3]** Aims to understand genetic models and historical perspectives needed for genetic research, while simultaneously teaching methodologies and experimental designs required for contemporary genetic research. Based on this, it aims to deepen the understanding of genetic models required for medical science and disease mechanism research.
- **HIL830 Advanced Genomics [3]** Aims to comprehend contemporary genomic research and to understand research design methods and research techniques necessary for genomic studies.
- **HIL832 Advanced Biostatistics [3]** Aims to understand and acquire research methodologies for effectively quantifying large amounts of biological data and analyzing heterogeneity. Students learn the operating principles related to various types of biostatistical techniques, data analysis, and visualization, and examine cases applied to modern genomic and quantitative biology research.

- **HIL834 Biological Data Visualization [3]** Introduces research methodologies and techniques required for biological data visualization, and lectures/discusses various interpretations and data approach methods based on them.
- **HIL835 Advanced Cancer Biology [3]** Provides an overall understanding of oncology, deeply examines fields currently studied in oncology, and helps understand the historical direction of oncology research and where it is headed in the future.
- **HIL836 Cancer Metabolism [3]** Provides a general understanding of metabolic processes occurring in normal cells and covers how these metabolic processes alter in cancer cells. Presentations and discussions are conducted on therapeutic mechanisms that can exploit these abnormal metabolic processes.
- **HIL837 Studies on Cell Death [3]** Teaches basic information related to cell death, builds an understanding of differences among various recently discovered types of cell death, and covers the functions of cell death in terms of disease development or treatment.
- **HIL838 Special Topics in Cancer Biology Research [3]** Studies the latest research trends in oncology alongside experimental methods and technologies used within it, providing opportunities to study and discuss latest questions and hypotheses emerging in oncology research.
- **HIL883 Ion Channels [3]** Understands the structure, function, and relevant signaling mechanisms of ion channels existing in living cell membranes.
- **HIL899 Special Topics in Synthetic Biology [3]** Presents academic learning on designing/manufacturing biological components and systems that do not exist in nature, or redesigning/manufacturing existing biological systems by introducing concepts of componentization, standardization, and modularization—used in various engineering technologies—to genes, proteins, etc., that constitute biosystems.