Dept. of Integrative Biotechnology

The Department of Integrative Biotechnology systematically educates students by providing a curriculum that combines advanced major fields and applied technologies to foster advanced researchers with advanced knowledge and skills related to the search, discovery, and development of functional biomaterials for medicine, food, beauty, and industrial use by combining advanced biotechnology. In addition, the Department of Integrative Biotechnology not only operates joint education and research exchange programs with leading research groups at core national research institutes and prestigious universities overseas, but also operates various education and research exchange programs linked to the country's sustainable growth policies.

Through such multidisciplinary and international education and research programs, the Department of Integrative Biotechnology is fostering future-oriented professionals with global and professional capabilities to grow into core personnel for domestic and foreign companies in the bio sector, government-funded research institutes, and government ministries, and is fostering bio start-up and venture entrepreneurs with creative capabilities.

☐ Courses

❑ Integrative Biotechnology Major Courses

■ Biomaterials Verification and Scale-up Practice

Course on proof-of-concept to industrial scale-up of environmental and bio-based materials, including AI-based analytical applications and case studies on environmental problem solving.

■ Current Topics in Bioprocess Engineering

Course on the industrialization techonology of biological materials including fermentation and purification and bioprocess

■ Biomaterials Development Research

Research course applying advanced AI and data-driven interdisciplinary technologies to the discovery, development, and application of bio-based materials.

■ Biomaterials Production Research

Research course applying advanced AI and data-driven interdisciplinary technologies to the production, separation, and purification of bio-based materials.

■ Industry-Academic Collaborative Development Project

This course extends and deepens industry-academia projects in bio-material development and production through the PBR-MAX program, providing guidance to support outcomes such as patents and publications.

■ GMP and Biomaterials Analysis

Course on the understanding the concept of GMP and analysis of biological materials produced by GMP process. It also introduces the current technology and their principles

■ Biomaterials Commercialization Strategy Practice

Course on the practical research duties including statistical analysis, patent writing, SOP writing, and experimental design

■ Industry-Academic Collaborative Development Project

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■ Biomaterials Big Data and AI

Course on basic Python programming and practical use of bioinformatics big data, including data collection, analysis, and machine learning for predicting bio-material structures and functions.

■ Biomaterials Business Model

Course on essential technologies and business knowledge for bio-based industry management and entrepreneurship, including accounting, marketing, and data analysis.

■ Current Topics in Advanced Bionanomaterials

Course on the industrialization of bionano materials including their current progress, application and industrialization

■ Advanced Metabolic Biochemistry

Course focusing on major metabolic pathways and their interactions to understand biosynthesis mechanisms of bio-based materials in eukaryotic, prokaryotic, or animal cells.

■ Advanced Biotechnology

This course covers the recent research trend and technology in the area of bioinformatics, gene cloning, construction of genetically modified microorganisms, production of recombinant enzymes in microbial systems and kinetic analysis of recombinant enzymes.

■ Convergence Biotechnology Seminar II

Course on the scientific writing and presentation for research management, thesis and paper

■ Convergence Biotechnology Seminar I

Course on the scientific writing and presentation for research management, thesis and paper

■ Advanced Immunology

Studies and discuss on the current research trend in cells and biomecules that constitute an immune system and their physiological function, and in the development of new immune materials and vaccine.

■ Advanced Bioenergy Engineering

Course on the basics and application of bio-energy. It pursues the understanding of various bio-energetical understanding for sustainable economy

■ Industrial Microbiology

Course analyzing applications of microbes and case studies on problem-solving and technological innovation in food, pharmaceutical, enzyme, bio-material, environmental, and energy industries, including AI and interdisciplinary technology applications.

■ Advanced Synthetic Biology

Course on fundamental principles of synthetic biology for bio-material production, including AI-based biofoundry concepts using DBTL (Design-Build-Test-Learn).

■ Advanced Biomaterials

Course on materials derived from or inspired by biological principles and their applications in pharmaceuticals, cosmetics, medical devices, food, and environmental industries.

■ Special Topics in Medicinal Biotechnology

This lecture covers the state-of-art of the development, evaluation and mass production of new medicinal materials through in-depth understanding of human diseases.

■ Advanced Physiology

Homeostasis refers to stability, balance or equilibrium. It is the body's attempt to maintain the stability of the human body's internal environment in response to changes in external conditions. Nervous System, Endocrine System, Cardiovascular System, Digestive System, Respiratory System and Circulatory System will be studied.

■ Advanced Systems Biology

Inter-disciplinary field of study that focuses on complex interactions within biological systems, using a more holistic perspective approach to biological and biomedical research.

■ Advanced Molecualr Biology

Studies and discuss on the current research trend in replication, transcription, translation, gene expression and regulation, cell structure and function at the molecular cell biology level.

■ Advanced Cell Biology

Studies and discuss on the current research trend in cell structure, organell function, cellular signaltransduction, and tumorigenesis at molecular level.

■ Advanced Neuroscience

The nervous system -the brain, spinal cord, and nerves of the body-is crucial for life and enables you to sense, move, and think. General knowledge in neurobiology, sensory and motor systems, the brain and behavior, and the cellular and molecular basis of learning and memory will be studied.

■ Advanced Cellular Engineering

Course on advanced theories and technologies, including AI-integrated methods for cell engineering, covering applications in bio-material production, including eco-friendly materials.

■ Advanced microbiology

Studies and discuss on the current research trend in the nutrition, growth, metabolism, physiology, molecular genetics, genomes of diverse microorganisms.

■ Biomaterials Convergence Research Practice I

This course is part of the SMILE-MAX specialization program, focusing on bio-material development technologies and multidisciplinary, industry-oriented research activities aligned with industrial needs.

■ Current Topics in Enzymology

This subject studies general propoerties of enzyme reactions such as enzyme activity, substrate specificity, and enzyme catalysis.

■ AI-Based Materials Development

Course on design, discovery, and optimization of new bio-materials using AI and big data, including database construction, molecular/material property prediction, and high-throughput screening.

■ Practical Biomaterials Data Analysis

Course on understanding the structure of biological and multi-layered big data from bio-material discovery and application, with practical computational biology projects for data analysis and prediction.

■ Advanced Biomaterial Analysis Technologies

Course on advanced analytical technologies for qualitative and quantitative analysis of bio-based materials, covering molecular and cellular structures, and methods for interpreting large-scale multimodal data and building predictive models.

■ Biomaterials Discovery and Preservation

Course on integrated bio-resource discovery and conservation, covering traditional methods, AI-based predictive models, big data analysis, preservation techniques, digital databases, and blockchain-based resource management.

■ Fundamentals of Biomaterials Experimentation

Course on basic experimental techniques for bio-material extraction, purification, analysis, and application, including experiment design, data analysis, and interpretation.

■ Biomaterials Convergence Research Practice II

This course offers the SMILE-MAX specialized program, which focuses on bio-based material production technologies and supports multidisciplinary, industry-driven practical research activities.

■ Biomaterials and Industry

Course on the definition and significance of bio-based materials, and on industrial and policy trends, providing a foundation for advanced technology development and commercialization.

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