Life Science and Biotechnology (LSBT) is a core and platform Research and Development area that will lead the international and domestic industries in the 21st century. It involves the most modern forms of biological, biomedical, and biochemical engineering researches that focus on the functional and therapeutic roles of genes, proteins, tissues or organs which are the cellular, biochemical, and molecular bases of life. Recently the scope of Life Science and Biotechnology research is being extended into embryonic/adult stem cell researches and animal cloning. The outcomes of these basic researches can lead to the development of new therapeutic drugs, diagnostic kits, biomaterials, and biochemical processes for clinical and industrial applications.

The Life Science and Biotechnology program of UIC provides the basic and advanced levels of courses comprising the key concepts about the diverse biological phenomena and various advanced technologies such as manipulation of microorganisms, eukaryotic cells, tissues, and organs at the cellular and molecular levels. Most of these courses will be taught by a team of faculty members in Yonsei University and Yonsei Medical Center who are the leading scientists in their research areas. The broad umbrella of the Life Science and Biotechnology program of UIC also encompasses fundamental and applied researches on bioprocess engineering (upstream and downstream processes), bio-analytical method developments, rational drug design, bioinformatics, information technology, applied organic chemistry, as well as the development of novel biomaterials and new functional foods. A Nobel Laureate scientist in protein chemistry and a world-leading Biomedical scientist from Yale Medical School and University of California, Berkeley will teach a couple of special lecture courses that will introduce the most advanced knowledges and international trends in each research area. UIC faculty members will open their laboratories to UIC students for independent research projects. The goal of the independent research project is to publish internationally competitive research papers during his/her undergraduate period.

The Life Science and Biotechnology major will prepare the students to be productive and innovative research scientists and organizational members with an understanding of the fundamental context of their research and how it relates to industrial and clinical applications, so that eventually they can take leadership roles in their academic and industrial fields.

According to a student’s future plan in the area of Life Science and Biotechnology, UIC faculty members, including endowed chair scientists, will become the academic advisor to guide a student’s future career. With a solid academic background in the fundamentals of Life Science and Biotechnology, in-depth research experiences in the laboratory, and effective communication and teamwork skills, our students have proven to be well prepared for professions covering the full range of the biotechnology industry. Our graduates pursue successful careers in basic and applied researches, regulatory affairs, patent law, technology transfer, marketing, management, intellectual property, and business consulting. The success of our alumni speaks for itself.
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• In order to fulfill the basic science courses requirement during the first year, LSBT majors may take one course from either the World Literature or World History sequences during their sophomore year.

• In lieu of “Senior Thesis An Independent Study,” LSBT students will take “Junior Independent Study” and “Senior Independent Study” (1 year, total 3 credits each)

○ Major/Minor Requirements ○

• Basic Science Courses Requirement

A. LSBT majors/double majors admitted in 2008 and thereafter have to take 18 credit-hours out of the electives: General Biology and Laboratory I, II, General Chemistry and Laboratory I, II, Calculus and Vector Analysis I, II, General Physics and Laboratory I, II. The first 12 credit-hours will come from taking one courses from each group. The remaining 6 credit-hours will come from taking any two courses among remaining courses.

B. LSBT majors/double majors admitted in 2008 and before have to take 18 credit-hours from the following courses: General Biology and Laboratory I, II (3+3), General Chemistry and Laboratory I, II (3+3), Calculus and Vector Analysis I, II (3+3) or General Physics and Laboratory I, II (3+3)

* Students admitted in 2008 may fulfill the Basic Science Requirement by fulfilling either A or B.

* LSBT minors have to take General Biology and Laboratory I, II.

* These basic science courses are required but will not count toward fulfilling the major requirement.

• Major: LSBT majors admitted in 2008 have to fulfill 57 credit-hours (42 credit-hours for students admitted in 2007 and before) among LSBT courses including the following 8 requisite courses (24 credit-hours): General Microbiology, Organic Chemistry, Biochemistry, Cell Biotechnology, Molecular Biology, Chemical Biology, Experiment in Molecular Biotechnology, and Experiment in Microbiology and Biochemical Engineering.

LSBT majors admitted in 2009 and thereafter have to fulfill 57 credit-hours among LSBT courses including the following 5 requisite courses (15 credit-hours): Organic Chemistry, Biochemistry, Cell Biotechnology, Molecular Biology, and Experiment in Molecular Cell Biology

• Double Major: 36 credit-hours required within LSBT course offerings including the following 4 requisite courses (12 credit-hours): Biochemistry, Cell Biotechnology, Molecular Biology, and one course from
Experiment in Molecular Biotechnology, Experiment in Microbiology and Biochemical Engineering or Experiment in Molecular Cell Biology.

- **Minor:** 18 credit-hours required within LSBT course offerings including the following 3 requisite courses (9 credit-hours): Biochemistry, Cell Biotechnology, and Molecular Biology.

### Course Descriptions

**BIO1001 GENERAL BIOLOGY AND LABORATORY I**
This course is intended for bioscience and biotechnology major and students majoring other related science majors. It will be taught in the lecture/laboratory format. This course is designed to acquaint students with the fundamental principles and processes of life as found in microorganisms, plants, and animals, and their relation to the everyday life of man. In the laboratory students will be introduced to the methods of science and will apply them in a research setting.

**BIO1002 GENERAL BIOLOGY AND LABORATORY II**
This course is designed to provide principles of Biology and experiments about living organisms following the BIO1001 General Biology and Laboratory I.

**CHE1001,1002 GENERAL CHEMISTRY AND LABORATORY I, II**
This is the standard beginning college chemistry course for science majors. It covers chemical reactions and stoichiometry, gases, liquids and solids, atomic structure, chemical bonding, thermodynamics, and an introduction to chemical equilibrium.

**MAT1001,1002 CALCULUS AND VECTOR ANALYSIS I, II**

**PHY1001,1002 GENERAL PHYSICS AND LABORATORY I, II**
This is the standard beginning college physics course for science majors. It covers various physical reactions, their reaction components and physical laws to govern many physical reactions.

**BTE2102 (LSB3101) BIOCHEMISTRY**
Biochemistry asks how the remarkable properties of living organisms arise from various lifeless bio-molecules. From physical and chemical laws governing complex life phenomena, the course offers basic understanding of metabolism, structure and function of biomolecules such as carbohydrate, lipids, proteins and nucleic acids.

**BTE2200 ORGANIC CHEMISTRY**
First half of two-semester sequence in the fundamentals of modern organic chemistry. Structure and bonding, stereochemistry, reactivity and synthesis of carbon compounds. Detailed coverage of aliphatic hydrocarbons, alkenes, alkynes, and alkyl halides. Introduction to spectral techniques (IR, NMR and mass spectroscopy).

**BTE2201 BIOORGANIC CHEMISTRY**
Second half of a two-semester sequence in modern organic chemistry. Continuation of mechanistic approach to reactions and synthesis of organic compounds. Detailed coverage of carbonyl compounds (aldehydes, ketones, acids), aromatic chemistry and amines. Spectral techniques employed throughout.

**BTE2202 GENERAL MICROBIOLOGY**
This lecture covers the first half of the textbook, Brock Biology of Microorganisms, including structures and functions of cells, microbial physiology, gene expression and regulation, and introduction to virology. Students will learn about
the life of microorganisms and viruses and how microbiology provides basic and essential concepts useful in diverse fields of biological science and biotechnology.

BTE2402 APPLIED MICROBIOLOGY
Applied Microbiology course covers bacterial genetics, microbial diversity, viral diversity (bacteriophages and animal viruses), basic immunology, host-pathogen interactions, industrial microbiology, and practical application of genetic engineering. This course is designed mainly for 2nd year students majoring life sciences and biotechnology and requires a solid background in general microbiology and biology.

BTE2601 EXPERIMENT IN MOLECULAR BIOTECHNOLOGY
This class is very interactive lab course covering general molecular biology techniques. Students will perform various experiments covering such topics as DNA isolation, PCR, gene cloning, protein expression and purification, enzyme assays, cell culture, and virus infection.

BTE3201 BIOLOGICAL TRANSPORT PHENOMENA
Transport of momentum, energy and mass is essential for living organisms to sustain their lives. Investigating how the living organisms accomplish sophisticated ways of biological transport requires good understanding of transport phenomena including fluid mechanics, heat transfer, and mass transfer. Moreover, concepts and principles to be delivered in the course are prerequisites for bioengineers to design and operate downstream bioprocesses. This course is intended to provide students with fundamental principles in transport phenomena and relevant topics in biological systems.

UIC2301 INTELLIGENT INFORMATION SYSTEMS

BIO3107 NEUROBIOLOGY
This course is intended to provide the basic concept about how the neurological system can respond to the body stimulations, the components of neurological system, molecular and cellular phenomena for neuronal reactions. The second half of the course will cover the molecular and cellular aspects of various neurological diseases and the experimental strategies to develop the novel therapeutics for these diseases.

BTE3101 CELL BIOTECHNOLOGY
Understanding the structures of living cells and molecular regulatory mechanisms in cell signaling pathways. Study on pathogenesis and understanding the development of diseases induced by mutation. Concepts on gene therapy.

BTE3401(LSB3102) APPLIED BIOCHEMISTRY
From basic understanding of metabolism, structure and function of bio-molecules and their interactions governing complex life phenomena, the course aims to offer applications of fundamental principles of biochemistry for various human needs.

BTE3403 IMMUNOLOGY
This course is intended to provide the basic concept about how the immune system can respond to pathogenic infection, the components of immune system, molecular and cellular phenomena for immune reactions. In the second half of the course will cover the molecular and cellular aspects of various immunological diseases such as graft rejection in organ and tissue transplantation, autoimmune diseases such as Reumatoid Arthritis, Diabetes, Atopic Dermatitis, and the experimental strategies to develop the novel therapeutics for the treatment of these immunological diseases.

BTE3408 INSTRUMENTAL ANALYSUS IN BIOTECHNOLOGY
The general objective of this course is to survey the theory and practice of modern analytical instrumentation. Emphasis placed on the possibilities and limitations inherent in the various methods available to today's biotechnology.
The format involves three topics such as spectroscopy, chromatography and microscopy. A general framework for understanding instrumental methods will be presented.

BTE3409 NANO BIOTECHNOLOGY

LST3001 ADVANCED EXPERIMENTS IN LIFE SCIENCE AND TECHNOLOGY
This course will provide the advanced laboratory skills on Life Science and Technology experiments such as analysis of DNA, RNA and proteins, molecular and cellular manipulation of microorganisms, eukaryotic cells and plant cells, advanced level of bio-processing for generation of therapeutically important reagents, and therapeutic analysis of biologically active compounds.

LST3104 MOLECULAR BIOLOGY
This course will focus on the detailed mechanisms associated with genes and how gene expression is regulated in prokaryotes and in eukaryotes. Specific topics will include DNA replication, genome organization, transcription, RNA processing, translation, and RNA interference.

LST3201 PHYSIOLOGY
This course is intended to provide the basic concept about various physiological systems of a human body, the components of each physiological system, molecular and cellular phenomena for physiological reactions. The second half of the course will cover the molecular and cellular aspects of how body system can react to various body conditions and the experimental strategies to develop the novel therapeutics for the regulation of physiological systems.

LST3204 APPLIED ENVIRONMENTAL TOXICOLOGY
The observable, verifiable science of environmental toxicology. The study of toxic substances in the Earth’s natural processes in air, water, and soil as well as the chemical aspects of problems that human beings have created in the natural environment. To introduce the major concepts and principles of environmental toxicology through the routes and kinetics of toxicant uptake, methodological approaches, and factors affecting toxicity.

LST3205 EXPERIMENT IN MOLECULAR CELL BIOLOGY
Students will learn principles and practice of basic bacterial culture techniques, transformation, agarose gel electrophoresis, nucleic acid purification, nucleic acid quantification, DNA restriction digestion and analysis, polymerase chain reaction (PCR), mutagenesis and basic of computer based DNA sequence analysis and data acquisition over the internet. In addition, students will learn molecular cell biology technologies such as western bolt, immunofluorescence, RT-PCR.

LST4004 AIR AND WATER QUALITY
This is a Community Based Learning (CBL) course. The location of the community activities will be Air and Water Quality monitoring stations throughout Seoul. There will be a direct relationship between this course and the community activities: Air and Water Quality concepts and data will be covered in class. This course strives to apply the knowledge gained in on-campus courses to the actual monitoring of Air and Water Quality conditions in Seoul. The course is three credit hours, however, some weeks will require more than three hours due to travel time to and from monitoring stations. The course will be composed of one hour of lecture followed by two hours in the community. Some weeks will have no lecture and three hours in the community. Students will experience the accurate identification and quantification of chemicals and particulates in air and water so the public health and welfare and be protected.

LST4003 CANCER DEVELOPMENT
The molecular and cellular mechanisms that create cancer. The mutant genes and proteins involved in programming the abnormal proliferation of cancer cells which leads to the long, protracted process of the development of cancer.
The behavioral differences between individual cells from normal tissues and those from tumors, and how cancer cells learn to invade other tissues and create the metastases responsible for cancer mortality. To introduce the major concepts and principles of cancer biology including tumor viruses, oncogenes, signal transduction, tumor suppressors, the cell cycle, angiogenesis, metastasis, and cancer treatment.

UIC3101 4001 JUNIOR, SENIOR INDEPENDENT STUDY
This course will be the independent research program in which UIC student will choose the laboratory with his/her research interest at the beginning of his/her sophomore. The competitive research project will be assigned to a student and the research experiments using the advanced biotechnological tools will be carried out independently in the laboratory until his/her graduation. This course will enable a student to publish the research papers in internationally premier journal upon the completion of this course.

BIO4101 VIROLOGY
The course offers basic understanding of reproductive cycle of viruses. Major questions to be addressed include the structure of viruses, strategies that virus use to enter their host, harness and exploit host machineries to express and replicate their own genome and how new viruses emerge as new pathogens.

BTE4401 MOLECULAR BIOTECHNOLOGY
This course is designed for students who are interested in the fields related with molecular biotechnology and bioengineering.

BTE4402 BIOINFORMATICS
Lecture will begin with the object of biological data for bioinformatics and learn how to collect and manage bioinformatics data, then cover the computational tools for the analysis the biological data. It includes statistical, mechanical, and knowledge based methods, and finally design prediction model for some biological systems.

BTE3408 INSTRUMENTAL ANALYSIS IN BIOTECHNOLOGY
Principles and applications of modern methods of instrumental analysis for analytical chemistry measurements. Topics will be selected from the areas of absorption and emission spectroscopy, chromatography, mass spectrometry, surface analysis, and nuclear magnetic resonance.

BTE4407 INTRODUCTION TO NANO-BIOTECHNOLOGY
No micro- nano-manufacturing experience or courses were required for this class. First, the lecture will be focused on how to measure nano-structures, and then covers how to make nano-structures. After understanding these basic concepts of the nano-fabrication techniques, the lecture will cover the field of nano-biotechnology focusing on the application of nano-techniques to biological systems.

BTE4501 MEDICINAL CHEMISTRY
Study of the various classes of medicinal compounds with particular emphasis on biological activity, mechanism of action, bio-transformation, interaction of drugs with enzyme systems, and recent advances in drug design.

BTE4610 VIRUS AND HOST
This course is intended to provide an introduction to basic concepts in virology and viral life cycles and to cover topics of various host responses induced by virus infection. Lectures will be focused on in-depth molecular mechanisms for propagation of pathogenic human and animal viruses and how viral infection can be controlled.