

Integrative Bioscience Education Program

Subject Code	Subject	Credit	Content of subject		
11120043	Introduction to Integrative Bioscience	1	First, the educational program for Integrative Bioscience is introduced. Then, driving forces for rapid development of biology are reviewed from a historical point of view, and the features of contemporary life science are overviewed. Based on these reviews what the Integrative bioscience is and why it is necessary are discussed. Particularly, it is emphasized that a large volume of information on sequences and structures of genome, RNA, proteins, sugars, metabolites etc. and that of spacio-temporal expression of these molecules are integrated to understand their meaning at a cell, tissue, organ or organism level and to unravel the mechanisms of high order biological functions, diseases, environmental responses etc.	Prof.	Toshitaka Fujisawa
11080198	Functional Biomolecular Science	2	1. Bases and applications of solution and solid-state NMR spectroscopy in structural analyses of biomolecules 2. Overview of metalloproteins, Molecular mechanism of metalloproteins, Overview of spectroscopy for studying metalloproteins	Prof.	Koichi Kato
				Assoc.Prof.	Hiroshi Fujii
				Assoc.Prof.	Katsuyuki Nishimura
11070205	Structural Biomolecular Science	2	The molecular mechanisms of various biological processes will be lectured in this course. Especially, the molecular mechanisms of the following topics will be provided: DNA replication, transcription and translation of DNA, cellular homeostasis, biological energy conversion such as respiration and photosynthesis, sensory receptors, bioelectronics in a neuron, and some recent research topics.	Prof.	Shigetoshi Aono
				Assoc. Prof.	Yuji Furutani
11240069	Training Course for Bioinformatics	1	The following objectives are attained through lectures and practices. 1. To understand basic principles in biological sequence analyses. 2. To obtain basic skills in genomic and proteomic analyses. 3. To understand current topics and future directions in bioinformatics.	Assoc. Prof.	Shuji Shigenobu
11240066	Imaging Science	1	We are now enjoying various imaging techniques in the cutting edge of biological and medical sciences. The well known from old is microscopic techniques and nowadays MRI, PET and MEG are popular imaging tools. Imaging science is a novel discipline trying to integrate the old and the new. It consists of three categories, hardware tools to generate primary data, software tools to digitally process the primary data and imaging analysis to quantitatively analyze imaging digital data. In this lecture, 3D imaging and quantitative image analysis are in a particular focus. The former includes the theoretical background of 3D imaging and its practical applications with electron and light microscopy. The latter includes a novel quantitative image analysis based on various numerical algorithms.	Assoc.Prof.	Kazuyoshi Murata
				Assoc.Prof.	Shigenori Nonaka
11120044	Integrative Bioscience Series	1	To learn biological processes at various levels, covering molecular, cellular and individual processes, with broader perspective in an integrative manner, seven departments (Departments of Structural Molecular Science, Functional Molecular Science, Basic Biology, Physiological Sciences, Genetics, Evolutional Studies of Biosystems, and Statistical Science), which participate in the Integrative Bioscience Education Program, offer a series of 7 lectures in a manner understandable for every student.	Prof.	Koichi Kato
11120045	Introduction to Biomolecular Simulation	1	Basic theories and computational methods for molecular simulations for biomolecules will be introduced. For example, basic and various advanced methodologies for molecular simulations as well as fundamentals of analytical mechanics and statistical mechanics will be lectured.	Prof.	Shinji Saito
				Assoc.Prof.	Hisashi Okumura

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11250123	Integrative Evolutionary Studies	2	Biosystems on the earth can be classified into systems with different levels of complexity, from a cell to society. This course is to discuss evolution of such systems from the viewpoints of "elements (members) in each system", "interaction between elements" and "theory to describe this interaction".	Prof.	Yoko Satta
11240067	Molecular and Cellular Biology	2	Basic features of molecular and cellular biology will be lectured and discussed. These include regulation of transcription and translation, protein structure and function, post-translational modification, structure and dynamics of chromosome, structure and dynamics of cell, organelles and cytoskeleton, metabolism, protein traffic, signal transduction and cell imaging.	Prof.	Hiroyuki Araki
				Prof.	Tatsuo Fukagawa
				Prof.	Mikio Nishimura
				Assoc.Prof.	Nobuyuki Shiina
11960001	Bioinformatics	1	This course consists of short lecture series that provide basic theory and techniques to deal with a large amount of information on genomes, transcripts, proteins, sugars, metabolites etc and also to integrate these informations into networks. Credits will be given when students complete two of the following lecture: Genome Biology (Microorganism, Plant), Systems Biology, Mathematical Biology and Biological Information Processing.	Prof.	Yoko Satta
11960002	Origin of Life	1	How life was born and evolved to acquire a self-replicating capacity is discussed by lecturers in a wide perspective through the fields of organic chemistry, molecular biology, extremobiosphere research, astrobiology etc.	Prof.	Toshitaka Fujisawa
11120051	Fundamentals of Biomolecular Science	2	Core aspects of biophysical chemistry will be overviewed with the life-science student in mind. This course aims at cultivating the fundamentals necessary to complete the advanced courses of Structural Biomolecular Science and of Functional Biomolecular Science. The lectures will be given with life-science examples using a textbook covering the laws of thermodynamics, biological standard state, chemical equilibrium and its temperature dependence, vibrational spectroscopy, and nuclear magnetic resonance.	Prof.	Shuji Akiyama
				Prof.	Koichi Kato
				Assoc.Prof.	Katsuyuki Nishimura
				Assoc. Prof.	Yuji Furutani