[Title]			[Instructor]		
Bioethics and Environmental Psychology Advanced Study			Chiaki Kagawa / Nobutaka Motohashi / Akihiko Nunomura / Hiroki Ishiguro		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410510 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Wed.／VI-VII	Japanese

[Outline and purpose]

The aim of this course is to gain basic knowledge about bioethics, mental state of patients and mental illness that is relevant to healthcare providers and researchers of biomedical technologies. We will examine the bioethical principles from the historical perspective first, then focus our mind on apprehension of the properties of human mind and brain.

[Objectives]

1. to understand the meaning of bioethical principles.
2. to understand the elements which are indispensable for the scientific integrity.
3. to understand the basic relationship between human mind and brain.
4. to promote a better comprehension of common mental health problems as depression, anxiety and insomnia.

[Requirements]

No special requirements

[Evaluation]

Homework: 30%
Attendance: 70%

[Textbooks]

Instructions are given at the beginning of lecture.

[References]

Instructions are given at the beginning of lecture.

[Schedule]

1-3. Review of bioethical principles through the examination of the history of bioethics.
4. Review of the elements of research ethics.
5-6. Review of environmental psychology.

[Title]			[Instructor]		
Medical Engineering			Kazuyuki Uno / Hiroshi Kurosawa / Motonobu Hattori		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410610 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Thu.／VI	English／Japanese

[Outline and purpose]

State of the art in the field of medical engineering.

[Objectives]

To understand fusional researches of medicine and engineering.

[Requirements]

Basic knowledge on physics, electronics and electric engineering (Uno)
Fundamental knowledge of cells (Kurosawa)

[Evaluation]

Report (Uno)
Report (Hattori)

[Textbooks]

Distributed in the classroom

[References]

[Schedule]

* Growth and differentiation of stem cells (Kurosawa)
* Properties of embryonic stem (ES) cells (Kurosawa)
* Method for establishing induced pluripotent stem (iPS) cells (Kurosawa)

*Statistical approach to physics (Uno)
*Medical applications of gaseous discharge, light, and laser (Uno)

*Neuro-computing (Hattori)
*Cortico-hippocampal model for declarative memory (Hattori)

[Title]	[Instructor]
Introduction to Social and Environment Medicine	Zentaro Yamagata / Kenichiro Kitamura

[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410620 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Fri.／ VI-VII	English／ Japanese

[Outline and purpose]

In the lecture we will introduce an important issues on environmental factors and genetic factors related with diabetes. Current status and future perspectives and revolving researches and therapies will be introduced. Furthermore, current research activity, which we are conducting will be also introduced and be discussed.

[Objectives]

(Tetsuro Kobayashi)
1. to understand physiology and pathophysiology of glucose metabolism.
2. to understand socio-economical relationship between genesis of diabetes and diabetic complications.
3. to understand genetic and environmental factors related with diabetes.
(Takeo Kubota)
I plainly lecture epigenetics, a new approach toward better understanding of the association between environmental factors and genetic factors.

[Requirements]

Physiology, Genetics, Endocrinology and Metabolism

[Evaluation]

Discussion 100%

[Textbooks]

Manual of Diabetes Mellitus, Edited by Kobayashi T, 2012, Nankodo, Tokyo

[References]

instructions are given at a lecture

[Schedule]

(Tetsuro Kobayashi)
1. to understand physiology and pathophysiology of glucose metabolism.
2. to understand socio-economical relationship between genesis of diabetes and diabetic complications.
3. to understand genetic and environmental factors related with diabetes.
(Takeo Kubota) I introduce you the association between environmental factors and genetic factors via epigenetic mechanism and the related diseases.

[Title]			[Instructor]		
Introduction to Molecular Medicine			Toshihisa Ohtsuka / Kiyotaka Kugiyama / Katsue Inoue / Jian Yao / Hiroshi Ishihara		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410630 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Thu.／VI-VII	English／Japanese

[Outline and purpose]

- The aim of this lecture is to introduce the principles and mechanisms of the complicated intercellular interactions and communications, with special emphasis on the direct intercellular communication mediated by gap junctions. Topics to be covered include: intercellular communication, its function, regulation, as well as importance in maintenance of normal life activities
- To acquire the fundamental knowledge and techniques required for understanding the molecular mechanism for body response to environment

[Objectives]

(Jun Arita) To understand the actions and action mechanism for hormones as functional moles in the endocrine system.
To understand the development of therapeutic drugs by chemically modifying the hormone structure.
To understand the mechanism for the pathogenesis of endocrine diseases resulting from the abnormalities of hormones and their receptors.
(Masanori Kitamura)To understand responses of biological systems to environmental stimuli, this lecture introduces; 1) molecular mechanisms underlying cellular responses to environmental pollutants and pathogens, 2) development of genetic biosensor system, and 3) its application for monitoring of internal and external milieu.
(Jian Yao) to understand the complicated intercellular interactions in the maintenance of normal multicellular activities; 2) to understand the roles and molecular mechanisms of gap junctions in regulation of cellular behaviors; 3) to understand how the dysfunction of the integrated intercellular interaction contributes to the initiation and development of diseases, like cancer, diabetes and hypertension.
(Toshihisa Ohtsuka) This lecture deals with formation and maintenance of neural network in the brain and synaptic transmission. I will also give a recent summary on related neural disorders.

[Requirements]

Grounding in biology and basic medicine.

[Evaluation]

Class participation, attitude and understanding (problem sets, presentation and reports)

[Textbooks]

Chapter 24, Multicellularity, Molecular cell biology, edited by Harvey Lodish, et al, 6th Ed. (2007).
Gap junctions, edited by Elliot L. Hertzberg, (2000)

[References]

Saez J, et al: Plasma membrane channels formed by connexins: their regulation and functions, Physiological reviews, 2003; 83: 1359-1400.

[Schedule]

(Jian Yao) The first 30 min: general introduction on intercellular interactions
The second 30 min: introduction of gap junction, its structure, measurement, regulation and functions
The third 30 min: intercellular communication in diseases
The last 30 min: discussion, questions and answer
(Toshihisa Ohtsuka) This lecture deals with formation and maintenance of neural network in the brain and synaptic transmission. I will also give a recent summary on related neural disorders.

[Title]			[Instructor]		
Introduction to Bioregulation Research			Nobuyuki Enomoto / Iyoko Katoh / Atsuhito Nakao / Koji Moriishi / Tatsuyoshi Kawamura		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410640 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Thu.／VI-VII	English／Japanese

[Outline and purpose]

[Objectives]

(Nobuyuki Enomoto) Lecture on the basic and clinical aspect of viral hepatitis.
(Iyoko Katoh)Students will learn the mechanisms of cancer formation with emphasis on DNA damage responses and the functions of p53 tumor suppressor.
(Naotaka Shibagaki)I will present and discuss about the host defence against cancer cells in detail with recent data.Immunocompetent cells could attack the cancer cells if the immunosuppressive microenvironment is corrected properly.
(Koji Moriishi) To understand mechanisms by which microbes infect hosts,contribute to pathogenicity and escape from host protection.

[Requirements]

Basal knowledge about immunology

[Evaluation]

[Textbooks]

[References]

[Schedule]

(Naotaka Shibagaki.) 90 miniutes lecture include; Mechanism for the elicidation of immunosuppressive cancer microenvironment. How to treat the immunosuppressive cancer microenvironment?
A novel therapeutic strategies with protein-transduction technologies.

[Title]			[Instructor]		
Introduction to Neuroscience			Hiroyuki Kinouchi / Toshihiro Kitama / Kazuo Kitamura		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
410650 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Fri.／VII	Japanese

[Outline and purpose]

We give a lecture on basic knowledge and skill necessary for physiological research of central nervous system. Especially, we deal with sound analyzing system in the auditory cortex for perception of sound.

(Toru Horikoshi)
We deal with the basic concept of electrophysiological monitoring of the brain, which is inevitable in analysis of the results. We will focus on action potential of the neuron, near and far field potential which produce clinically recordable potentials. Topics include: electroencephalography, event-related potentials such as sensory evoked potential, motor evoked potential, visual evoked potential and auditory brainstem response.

[Objectives]

1 to understand basic concept of neurophysiology
2 to understand basic concept of auditory system.

(Toru Horikoshi)
1. to understand the basic concepts of clinical neurophysiology.
2. to understand the electrophysiological monitoring of the brain

[Requirements]

physics, mathematics, computer science

[Evaluation]

Discussion, presentation

[Textbooks]

instruct at a lecture

[References]

instruct at a lecture

[Schedule]

1 lecture on sound
2 lecture on perception (loudness, pitch, timber)
3 lecture on vowel and consonant
4 peripheral auditory system
5 primary auditory cortex

[Title]			[Instructor]		
Structural Biology			Masami Kusunoki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414025 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Fri.／II	Japanese

[Outline and purpose]

Structural biology is a field of the major biological sciences and contributes to the understanding of biological functions and processes in terms of three-dimensional structure of proteins. In this class, the lecture will focus on several topics of protein crystallography and structural biology such as membrane proteins. The students will be able to read research papers of structural biology and to use structural databases.

[Objectives]

To understand the foundation of protein crystallography
To be able to read research papers of structural biology

[Requirements]

Basic knowledge of biochemistry of proteins
Basic knowledge of physical chemistry

[Evaluation]

Submission of a report 70%
Attendance to the class 30%

[Textbooks]

[References]

1. Bernhard Rupp,Biomolecular crystallography, Garland Science
2. C. Giacovazzo, Fundamentals of Crystallography, Oxford Science Publications
3. 相原茂夫 編著, タンパク質野結晶化, 京都大学出版局
4. 倉光成紀 杉山政則 編集, 構造生物学, 共立出版(株)
5. 樋口 芳樹 , 中川 敦史, 構造生物学 ―原子構造からみた生命現象の営み―

[Schedule]

1. X-ray generator and synchrotron radiation
2. X-ray spectroscopy, absorption, and Thomson scattering
3. X-ray diffraction by crystals
4. Crystal symmetry, point groups, and space groups
5. Reciprocal space
6. X-ray data collection and processing at synchrotron radiation facilities
7. Multiple isomorphous heavy atom replacement method
8. Multiple anomalous dispersion method
9. Physical chemistry of protein solution for crystallization
10. Structural biology of membrane proteins
11-12. Structural biology of enzyme catalysis
13. Protein Data Bank
14-15. Protein architecture

[Title]			[Instructor]		
Structural Biology			Masami Kusunoki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414025 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／VI	Japanese

[Outline and purpose]

Structural biology is a field of the major biological sciences and contributes to the understanding of biological functions and processes in terms of three-dimensional structure of proteins. In this class, the lecture will focus on several topics of protein crystallography and structural biology such as membrane proteins. The students will be able to read research papers of structural biology and to use structural databases.

[Objectives]

To understand the foundation of protein crystallography
T be able to read research papers of structural biology

[Requirements]

Basic knowledge of biochemistry of proteins
Basic knowledge of physical chemistry

[Evaluation]

Submission of a report 70%
Attendance to the class 30%

[Textbooks]

[References]

1. Bernhard Rupp,Biomolecular crystallography,　Garland Science
2. C. Giacovazzo, Fundamentals of Crystallography,　Oxford Science Publications
3. 相原茂夫　編著, タンパク質野結晶化, 京都大学出版局
4. 倉光成紀　杉山政則　編集, 構造生物学, 共立出版(株)
5. 樋口　芳樹 , 中川　敦史, 構造生物学 ―原子構造からみた生命現象の営み―

[Schedule]

1. X-ray generator and synchrotron radiation
2. X-ray spectroscopy, absorption, and Thomson scattering
3. X-ray diffraction by crystals
4. Crystal symmetry, point groups, and space groups
5. Reciprocal space
6. X-ray data collection and processing at synchrotron radiation facilities
7. Multiple isomorphous heavy atom replacement method
8. Multiple anomalous dispersion method
9. Physical chemistry of protein solution for crystallization
10. Structural biology of membrane proteins
11-12. Structural biology of enzyme catalysis
13. Protein Data Bank
14-15. Protein architecture

[Title]			[Instructor]		
Advanced Lecture on Environmental Eco-System			Keiichi Masutani		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414060 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Mon.／V	Japanese

[Outline and purpose]

We deal with an active stable open-system, which is deeply concerned with various issues of life, from a viewpoint of the circulation of matter and energy, and the increase of entropy. After the review of a heat engine, we study photosynthesis as an example so as to understand how the dynamically stable system produces energy and low-entropy materials by the interactions to the outer environment. We also analyze the eco-system as a stable open-system, and consider the future of biotechnology which is in harmony with natural environment.

[Objectives]

3. to understand the basic concepts and laws of thermodynamics.
4. to understand the fundamental features of dynamically stable system.
5. to set objectives to a certain environmental issue, and to solve it by using the appropriate model and simulation.

[Requirements]

a grounding in physics, biology and mathematics

[Evaluation]

quiz, homework: 50%
discussion: 20%
presentation: 30%

[Textbooks]

instructions are given at a lecture

[References]

instructions are given at a lecture

[Schedule]

1. Review of thermodynamics (heat engine and the first law)
2. Review of thermodynamics (the second law)
3. Dynamically stable system (photosynthesis)
4. Dynamically stable system (general discussion)
5. Stable open-system (life)
6. Stable open-system (group)
7. Stable open-system (general discussion)
8. -15. Exercise (Project-Based Learning)

Through the reading of papers on environmental science, students will set objectives to a certain environmental issue by himself, and solve it by using the appropriate model and simulation.

[Title]			[Instructor]		
Advanced Lecture on Environmental Eco-System			Keiichi Masutani		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414060 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Mon.／VI	Japanese

[Outline and purpose]

We deal with an active stable open-system, which is deeply concerned with various issues of life, from a viewpoint of the circulation of matter and energy, and the increase of entropy. After the review of a heat engine, we study photosynthesis as an example so as to understand how the dynamically stable system produces energy and low-entropy materials by the interactions to the outer environment. We also analyze the eco-system as a stable open-system, and consider the future of biotechnology which is in harmony with natural environment.

[Objectives]

6. to understand the basic concepts and laws of thermodynamics.
7. to understand the fundamental features of dynamically stable system.
8. to set objectives to a certain environmental issue, and to solve it by using the appropriate model and simulation.

[Requirements]

a grounding in physics, biology and mathematics

[Evaluation]

quiz, homework: 50%
discussion: 20%
presentation: 30%

[Textbooks]

instructions are given at a lecture

[References]

instructions are given at a lecture

[Schedule]

9. Review of thermodynamics (heat engine and the first law)
10. Review of thermodynamics (the second law)
11. Dynamically stable system (photosynthesis)
12. Dynamically stable system (general discussion)
13. Stable open-system (life)
14. Stable open-system (group)
15. Stable open-system (general discussion)
16. -15. Exercise (Project-Based Learning)

Through the reading of papers on environmental science, students will set objectives to a certain environmental issue by himself, and solve it by using the appropriate model and simulation.

[Title]			[Instructor]		
Advanced Lecture on Cell Culture Engineering			Hiroshi Kurosawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414120 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Mon.／V	English／Japanese

[Outline and purpose]

Lecture on cell and tissue culture engineering. Especially, taking up culture engineering for stem cells, such as embryonic stem (ES) cells and induced pluripotent stem (iPS) cell. Expounding technical problems on stem cell culture, which should be solved in order to realize regenerative medicine.

[Objectives]

To understand the leading-edge research in stem cell technology.
To obtain an adequate knowledge of ES cells and iPS cells.

[Requirements]

[Evaluation]

[Textbooks]

[References]

Anthony Atala and Robert P. Lanza, Methods of Tissue Engineering, Academic Press (ISBN:0124366368)

[Schedule]

1) Introduction and fundamental knowledge of cells
2) How proteins determine the work of cell
3) How DNA encode proteins
4) Fundamental knowledge of stem cells
5) Embryonic stem cells
6) How iPS cell are generated
7) Discussion
8) Application of pluripotent stem cells to regenerative medicine
9) Technical problems on stem cell research
10) Technical problems to realize regenerative medicine
11) Ethical problems on the application of pluripotent stem cells to regenerative medicine
12) Leading-edge research on iPS cells
13) Discussion
14) Presentation of your solution
15) Overview

[Title]			[Instructor]		
Advanced Lecture on Cell Culture Engineering			Hiroshi Kurosawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414120 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Mon.／VI	English／Japanese

[Outline and purpose]

Lecture on cell and tissue culture engineering. Especially, taking up culture engineering for stem cells, such as embryonic stem (ES) cells and induced pluripotent stem (iPS) cell. Expounding technical problems on stem cell culture, which should be solved in order to realize regenerative medicine.

[Objectives]

To understand the leading-edge research in stem cell technology.
To obtain an adequate knowledge of ES cells and iPS cells.

[Requirements]

[Evaluation]

[Textbooks]

[References]

Anthony Atala and Robert P. Lanza, Methods of Tissue Engineering, Academic Press (ISBN:0124366368)

[Schedule]

1) Introduction and fundamental knowledge of cells
2) How proteins determine the work of cell
3) How DNA encode proteins
4) Fundamental knowledge of stem cells
5) Embryonic stem cells
6) How iPS cell are generated
7) Discussion
8) Application of pluripotent stem cells to regenerative medicine
9) Technical problems on stem cell research
10) Technical problems to realize regenerative medicine
11) Ethical problems on the application of pluripotent stem cells to regenerative medicine
12) Leading-edge research on iPS cells
13) Discussion
14) Presentation of your solution
15) Overview

[Title]			[Instructor]		
Advanced Lecture on Bio-Function of Natural Products			Hideyuki Shinmori		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414125 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／V	Japanese

[Outline and purpose]

Natural products are concerned with the biological activity in organism. Recently, the role of natural products has been elucidated by the development of the synthesis and analysis for the natural products at the numerator level. In this lecture, the bioactivities of natural products are chemically discussed and illustrated.

[Objectives]

1. to understand the bioactivities of various natural products at the numerator level
2. to acquire the knowledge concerning the use of natural products

[Requirements]

a grounding in bio-organic chemistry

[Evaluation]

final examination : 70%
attendance : 30%

[Textbooks]

[References]

[Schedule]

1. Relation between natural products and environment
2. Influence of natural products on organism
3. Classification and function of natural products
4. Analytical methods of functional natural products
5. Synthesis of natural products derivatives
6. Function of artificial molecules modified by natural products
7. Physical properties of natural products
8. Nature-mimetic molecular design
9. Functional materials by natural products
10. Role of natural products in biometerials
11. Natural products derivatives for environmental improvement
12. Natural products for medicine
13. Molecular recognition by natural products
14. Nanobiotechnology utilized natural products
15. Prospect of functional natural products

[Title]			[Instructor]		
Advanced Lecture on Bio-Function of Natural Products			Hideyuki Shinmori		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414125 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／VI	Japanese

[Outline and purpose]

Natural products are concerned with the biological activity in organism. Recently, the role of natural products has been elucidated by the development of the synthesis and analysis for the natural products at the numerator level. In this lecture, the bioactivities of natural products are chemically discussed and illustrated.

[Objectives]

1. to understand the bioactivities of various natural products at the numerator level
2. to acquire the knowledge concerning the use of natural products

[Requirements]

a grounding in bio-organic chemistry

[Evaluation]

final examination：70%
attendance：30%

[Textbooks]

[References]

[Schedule]

1. Relation between natural products and environment
2. Influence of natural products on organism
3. Classification and function of natural products
4. Analytical methods of functional natural products
5. Synthesis of natural products derivatives
6. Function of artificial molecules modified by natural products
7. Physical properties of natural products
8. Nature-mimetic molecular design
9. Functional materials by natural products
10. Role of natural products in biometerials
11. Natural products derivatives for environmental improvement
12. Natural products for medicine
13. Molecular recognition by natural products
14. Nanobiotechnology utilized natural products
15. Prospect of functional natural products

[Title]			[Instructor]		
Advanced Genome Information Science			Satoko Noda		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414135 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／V	Japanese

[Outline and purpose]

The genomes contain the information that determine structure and function of individual organization. In addition to molecular biology, study in the area of computational biology will enable to generate meaningful solutions from large data sets, such as recent genomics and meta-genomics research. In this class, you will be given a project in the area of genomics and molecular phylogeny. At the end of semester, you will submit an illustrated report of findings and a brief seminar.

[Objectives]

To understand recent molecular biology techniques.
To learn various methods for elucidation of genome functions
To learn how to reconstruct molecular phylogenetic tree.

[Requirements]

Basic knowledge of molecular genetics and microbiology

[Evaluation]

Presentation 50%
Attendance & participation 50%

[Textbooks]

[References]

[Schedule]

1. Outline of Molecular Biology
2. Structure and function of genome
3. omics 1
4. omics 2
5. meta-genomics
6. single cell genomics
7. Presentation
8. Discussion
9. Outline of molecular evolution
10. Evolutionary rate of the gene
11. Evolutionary models
12. Phylogenetic tree
13. Presentation
14. Discussion
15. Overview

[Title]			[Instructor]		
Advanced Genome Information Science			Satoko Noda		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414135 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／VI	Japanese

[Outline and purpose]

The genomes contain the information that determine structure and function of individual organization. In addition to molecular biology, study in the area of computational biology will enable to generate meaningful solutions from large data sets, such as recent genomics and meta-genomics research. In this class, you will be given a project in the area of genomics and molecular phylogeny. At the end of semester, you will submit an illustrated report of findings and a brief seminar.

[Objectives]

[Requirements]

Basic knowledge of molecular genetics and microbiology

[Evaluation]

Presentation 50%
Attendance & participation 50%

[Textbooks]

[References]

[Schedule]

1. Outline of Molecular Biology
2. Structure and function of genome
3. omics 1
4. omics 2
5. meta-genomics
6. single cell genomics
7. Presentation
8. Discussion
9. Outline of molecular evolution
10. Evolutionary rate of the gene
11. Evolutionary models
12. Phylogenetic tree
13. Presentation
14. Discussion
15. Overview

[Title]			[Instructor]		
Advanced Lecture on Mathematics in Biotechnological Sciences			Masahisa Sato / Masaki Kobayashi		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414190 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Wed.／V	English／Japanese

[Outline and purpose]

We arrange our purpose by individual research object.

[Objectives]

We arrange our purpose by individual research object.
Final goal is to create mathematical theory which is necessary to advance research.

[Requirements]

Basic instruction of mathematics .

[Evaluation]

Presentation　80%
Research attitude　20%

[Textbooks]

We do not indicate text book, but we select textbooks depending on research object.

[References]

We do not indicate reference in priori, but we select references depending on research object.

[Schedule]

These will be decided by research schedule.

[Title]			[Instructor]		
Advanced Technology for Utilization of Biological Function			Takashi Ohtsuki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414210 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Wed.／V	Japanese／English

[Outline and purpose]

Technology for utilization of biological function has stepped to a stage of comprehensive understanding and taking advantage of various organisms including isolated microorganisms, plant/animal cells, and their communities. The strategies how to combine and utilize organisms' functions will be discussed.

[Objectives]

1. Ability of task performance.
2. Ability of total management.

[Requirements]

Specialty in biotechnology field at least graduate school level.

[Evaluation]

Report work: 50%
General discussion: 20%
Presentation: 30%

[Textbooks]

Not assigned

[References]

Not assigned

[Schedule]

1. Introduction to 'Technology for Utilization of Biological Function'
2. Relationship between human being and other organisms –past, present and future days
3. Hot-topics in analysis of biological function
4. Utilization of isolated microorganisms 1
5. Utilization of isolated microorganisms 2
6. Utilization of isolated microorganisms 3
7. Utilization of microbial communities 1
8. Utilization of microbial communities 2
9. Utilization of symbionts and parasites 1
10. Utilization of symbionts and parasites 2
11. Utilization of cultured plant cells
12. Utilization of plants
13. Utilization of cultured animal cells
14. Utilization of animals
15. Final discussion

[Title]			[Instructor]		
Advanced Technology for Utilization of Biological Function			Takashi Ohtsuki		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414210 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Wed.／VI	Japanese／English

[Outline and purpose]

Technology for utilization of biological function has stepped to a stage of comprehensive understanding and taking advantage of various organisms including isolated microorganisms, plant/animal cells, and their communities. The strategies how to combine and utilize organisms' functions will be discussed.

[Objectives]

3. Ability of task performance.
4. Ability of total management.

[Requirements]

Specialty in biotechnology field at least graduate school level.

[Evaluation]

Report work: 50%
General discussion: 20%
Presentation: 30%

[Textbooks]

Not assigned

[References]

Not assigned

[Schedule]

1. Introduction to 'Technology for Utilization of Biological Function'
2. Relationship between human being and other organisms –past, present and future days
3. Hot-topics in analysis of biological function
4. Utilization of isolated microorganisms 1
5. Utilization of isolated microorganisms 2
6. Utilization of isolated microorganisms 3
7. Utilization of microbial communities 1
8. Utilization of microbial communities 2
9. Utilization of symbionts and parasites 1
10. Utilization of symbionts and parasites 2
11. Utilization of cultured plant cells
12. Utilization of plants
13. Utilization of cultured animal cells
14. Utilization of animals
15. Final discussion

[Title]			[Instructor]		
Advanced Course on Reproductive Biotechnology			Teruhiko Wakayama		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414215 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Fri.／V	Japanese

[Outline and purpose]

Reproductive biotechnology is a field of the major life sciences and contributes to the understanding of animal reproduction. In this lecture, the mechanism of fertilization, early embryo development and assisted reproductive technology are addressed first to understand industrial applications of medicine and domestic animals. For further applications, animal cloning, chimera and intracellar sperm injection (ICSI) are stated.

[Objectives]

Acquisition of advanced knowledge about medicinal and domestic application

[Requirements]

General knowledge about animal reproduction

[Evaluation]

Final examination: 40%
Attendance attitude: 60%

[Textbooks]

Principles of Cloning Second edition. Ed. Cibelli J. Gurdon J. Wilmut I. Jaenisch R. Lanza R. West MD. Campbell KHS, Academic press, San Diego, USA, 2013, p137-p148. ISBN: 978-0-12-386541-0

[References]

[Schedule]

1. Introduction
2. Generation of gamete cell in body
3. Oocyte, sperm and fertilization
4. Early embryo development
5. Sex control by biopsy or sperm selection
6. Gamete preservation in liquid nitrogen
7. Gamete preservation in room temperature
8. Assisted reproductive technology
9. Intracytoplasmic sperm injection and its application
10. Establishment of embryonic stem cells
11. Establishment of iPS cell and STAP-stem cells
12. Generation of chimera animals
13. Generation of cloned animals
14. Generation of gene modified animals
15. General overview and final examination

[Title]			[Instructor]		
Advanced Course on Reproductive Biotechnology			Teruhiko Wakayama		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414215 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Fri.／VI	Japanese

[Outline and purpose]

Reproductive biotechnology is a field of the major life sciences and contributes to the understanding of animal reproduction. In this lecture, the mechanism of fertilization, early embryo development and assisted reproductive technology are addressed first to understand industrial applications of medicine and domestic animals. For further applications, animal cloning, chimera and intracellar sperm injection (ICSI) are stated.

[Objectives]

Acquisition of advanced knowledge about medicinal and domestic application

[Requirements]

General knowledge about animal reproduction

[Evaluation]

Final examination: 40%
Attendance attitude: 60%

[Textbooks]

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[References]

[Schedule]

1. Introduction
2. Generation of gamete cell in body
3. Oocyte, sperm and fertilization
4. Early embryo development
5. Sex control by biopsy or sperm selection
6. Gamete preservation in liquid nitrogen
7. Gamete preservation in room temperature
8. Assisted reproductive technology
9. Intracytoplasmic sperm injection and its application
10. Establishment of embryonic stem cells
11. Establishment of iPS cell and STAP-stem cells
12. Generation of chimera animals
13. Generation of cloned animals
14. Generation of gene modified animals
15. General overview and final examination

[Title]			[Instructor]		
Advanced Intelligent Information System Design I			Kentaro Go / Atsushi Kara / Masaki Omata		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414530 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／IV	Japanese

[Outline and purpose]

In this lecture, we discuss information processing and communication as the essential nature of human activity, which includes human information processing, communication between human and artifact, human-to-human communication via artifact, and technology and design to realize these relationships. Topics in the lecture include:

1. models for human information processing and multi-modal interface
2. technologies for artifacts to support communication
3. design methods for communication between human and artifact

[Objectives]

To understand the following topics:

1. models for human information processing and multi-modal interface
2. technologies for artifacts to support communication
3. design methods for communication between human and artifact

[Requirements]

Basic knowledge on computer systems, graphical user interfaces, and multi-modal interfaces. Entry-level knowledge on TCP/IP protocol for computer networks (e.g., experience for configuring an IP address, net-mask, default gateway and DNS). Lectures on computer networks will be given on line.

[Evaluation]

Report / presentation: 100%

[Textbooks]

Lecture handouts will be provided as necessary.

[References]

John M. Carroll (ed.), HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science, Elsevier, 2003.

[Schedule]

1. Introduction
2. Research Presentation
3. Research Presentation (cont'd)
4. Vision-based design methods
5. HCI examples: text entry methods for touchscreen
6. HCI examples: text entry methods for joystick
7. Multi-modal interfaces
8. User interfaces with physiological sensing
9. Technologies for augmented/mixed reality systems
10. Threats in computer networks
11. Introduction to IPsec/IKE
12. VPN design with IPsec/IKE
13. Research Discussion
14. Research Discussion (cont'd)
15. Summary and concluding Remarks

[Title]			[Instructor]		
Advanced Intelligent Information System Design I			Kentaro Go / Atsushi Kara / Masaki Omata		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414530 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／V	Japanese

[Outline and purpose]

In this lecture, we discuss information processing and communication as the essential nature of human activity, which includes human information processing, communication between human and artifact, human-to-human communication via artifact, and technology and design to realize these relationships. Topics in the lecture include:

1. models for human information processing and multi-modal interface
2. technologies for artifacts to support communication
3. design methods for communication between human and artifact

[Objectives]

To understand the following topics:

1. models for human information processing and multi-modal interface
2. technologies for artifacts to support communication
3. design methods for communication between human and artifact

[Requirements]

Basic knowledge on computer systems, graphical user interfaces, and multi-modal interfaces. Entry-level knowledge on TCP/IP protocol for computer networks (e.g., experience for configuring an IP address, net-mask, default gateway and DNS). Lectures on computer networks will be given on line.

[Evaluation]

Report / presentation: 100%

[Textbooks]

Lecture handouts will be provided as necessary.

[References]

John M. Carroll (ed.), HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science, Elsevier, 2003.

[Schedule]

1. Introduction
2. Research Presentation
3. Research Presentation (cont'd)
4. Vision-based design methods
5. HCI examples: text entry methods for touchscreen
6. HCI examples: text entry methods for joystick
7. Multi-modal interfaces
8. User interfaces with physiological sensing
9. Technologies for augmented/mixed reality systems
10. Threats in computer networks
11. Introduction to IPsec/IKE
12. VPN design with IPsec/IKE
13. Research Discussion
14. Research Discussion (cont'd)
15. Summary and concluding Remarks

[Title]			[Instructor]		
Advanced Intelligent Information System Design II			Kenji Ozawa / Masayuki Morisawa / Motonobu Hattori / Yuichiro Kinoshita		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414540 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Fri.／V	Japanese

[Outline and purpose]

Information processing in the brain of human beings has not been fully considered in computer science. As the first step to understand the information processing such like *Kansei* (emotion) and recognition of objects, we need to accumulate basic knowledge of sensory evaluation methods, physics of sensor devices, and neural and psychological models of the brain information processing. This course introduces fundamentals in these topics and shows how they are used as advanced intelligent information systems.

[Objectives]

1. To understand the basic methods of sensory evaluation
2. To understand the basic technology of the taste sensor.
3. To understand the basic information processing in artificial neural network models

[Requirements]

A grounding in algebra, analytics, statistics, and physics

[Evaluation]

Homework: 100%

[Textbooks]

[References]

天坂格郎，長沢伸也（共著）：官能評価の基礎と応用，日本規格協会，2000 年 (in Japanese)

[Schedule]

(Sensory evaluation methods)
1. Introduction to sensory evaluation
2. Basic methods of sensory evaluation
3. Multivariate analysis
4. Quantification theory
5. Summary (Part 1)

(Taste sensors and electronic nose)
6. Taste sensors using the membrane potential change
7. Optical taste sensors
8. Electronic nose
9. Other sensor devices
10. Summary (Part 2)

(Computational models of the brain)
11. Biological neuron and neural network
12. Neuron model
13. Neural network models
14. Information processing in neural network models
15. Summary (Part 3)

[Title]			[Instructor]		
Advanced Intelligent Information System Design II			Kenji Ozawa / Masayuki Morisawa / Motonobu Hattori / Yuichiro Kinoshita		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414540 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Fri.／VI	English／Japanese

[Outline and purpose]

Information processing in the brain of human beings has not been fully considered in computer science. As the first step to understand the information processing such like *Kansei* (emotion) and recognition of objects, we need to accumulate basic knowledge of sensory evaluation methods, physics of sensor devices, and neural and psychological models of the brain information processing. This course introduces fundamentals in these topics and shows how they are used as advanced intelligent information systems.

[Objectives]

1. To understand the basic methods of sensory evaluation
2. To understand the basic technology of the taste sensor.
3. To understand the basic information processing in artificial neural network models

[Requirements]

A grounding in algebra, analytics, statistics, and physics

[Evaluation]

Homework: 100%

[Textbooks]

[References]

天坂格郎，長沢伸也（共著）：官能評価の基礎と応用，日本規格協会，2000 年（in Japanese）

[Schedule]

(Sensory evaluation methods)
1. Introduction to sensory evaluation
2. Basic methods of sensory evaluation
3. Multivariate analysis
4. Quantification theory
5. Summary (Part 1)

(Taste sensors and electronic nose)
6. Taste sensors using the membrane potential change
7. Optical taste sensors
8. Electronic nose
9. Other sensor devices
10. Summary (Part 2)

(Computational models of the brain)
11. Biological neuron and neural network
12. Neuron model
13. Neural network models
14. Information processing in neural network models
15. Summary (Part 3)

[Title]			[Instructor]		
Advanced Intelligent Information System Design III			Kenji Ozawa / Masanori Morise		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414550 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Tue.／IV	Japanese

[Outline and purpose]

This course covers major topics in speech and acoustical array signal processing. The first part of the course addresses speech information processing from past to present. There are many applications, for example, Text-To-Speech synthesis system and singing synthesizer have been widely used all over the world. The second part of the course addresses issues of acoustical array signal processing and introduces techniques to record the sound from a focused sound source. Array signal processing is essential in advanced human-computer-interaction systems such as a car navigation system.

[Objectives]

1. To understand the history and state-of-the-art techniques of speech and acoustical array signal processing.
2. To understand the ways how speech and acoustical array signal processing techniques are used in our daily lives and to apply these techniques to own problems to be solved.

[Requirements]

A grounding in mathematical analysis, linear algebra, and statistics

[Evaluation]

Report work and weekly examination: 100%

[Textbooks]

F. Asano, *Acoustical Array Signal Processing,* Corona Pub., Tokyo, 2011. (in Japanese)

[References]

[Schedule]

1. History of speech processing 1: Vocoder, Cepstrum, and Linear Predictive Coding (LPC)
2. History of speech processing 2: High-quality speech synthesis and its applications
3. Voice conversion technique: Voice conversion and voice morphing
4. *Kansei* information processing in speech: Voice personality, emotion and likability
5. Singing information processing
6. Statistical parametric speech synthesis
7. Infrastructure in speech and singing
8. Basis of array signal processing: modelling of sound propagation using complex sinusoids and matrices
9. Basis of parameter estimation 1: Non-Bayesian inference
10. Basis of parameter estimation 2: Bayesian inference
11. Sound source separation using a beamformer
12. Sound source localization by the subspace method
13. Sound source localization by the sparse modelling
14. Application of array signal processing
15. Summary

[Title]			[Instructor]		
Advanced Intelligent Information System Design III					
[Code]	[Credits]	[Program]	[Hours]	[Hours]	[Language of instruction]
414550 B	2	Human Environment Medical Engineering Life Information Systems Course	This subject isn't offered.		Japanese

[Outline and purpose]

Enrollees read recent or important articles on intelligent measurement, particularly measurement of biological signals, and discuss them. Additionally, I lecture on system design to measure and process biological signals, images, and sounds. This class provides you an opportunity to be equipped for the research using biological signal processing technology.

[Objectives]

1. Reading articles on intelligent measurement
2. To acquire the system design skills for measurement of biological signals, images, or sounds
3. To acquire the system design skills for processing of biological signals, images, or sounds

[Requirements]

A grounding in signal processing, statistics, and computer programing

[Evaluation]

Homework: 50%
Presentation & discussion: 50%

[Textbooks]

[References]

[Schedule]

1. Overview of digital signal/image processing (biological electrical signal)
2. Overview of digital signal/image processing (biological image)
3. Overview of digital signal/image processing (biological sound)
4. Overview of digital signal/image processing (other biological signals)
5. Summary (Part 1)
6. Reading articles on the recent topics of intelligent measurement (biological electrical signal)
7. Reading articles on the recent topics of intelligent measurement (biological image)
8. Reading articles on the recent topics of intelligent measurement (biological sound)
9. Reading articles on the recent topics of intelligent measurement (other biological signals)
10. Summary (Part 2)
11. Design of measurement systems of biological signals, images, or sounds (basic level)
12. Design of measurement systems of biological signals, images, or sounds (advanced level)
13. Design of processing systems of biological signals, images, or sounds (basic level)
14. Design of processing systems of biological signals, images, or sounds (advanced level)
15. Summary (Part 3)

[Title]			[Instructor]		
Advanced Applied Cognitive Science			Shuji Morita		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414560 A	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Tue.／IV-V	Japanese

[Outline and purpose]

In order to recognize the world and even ourselves, we have to have an image, forged according to patterns determined by our culture and time. We will study these patterns from an historical and structural point of view.

[Objectives]

Try
1) to understand that a story is an important media forming our informational environment
2) to acquire basic methods to study stories in terms of meaning and form.
3) to study various genres from the point of cultural history

[Requirements]

[Evaluation]

Homework : 50 %
Communicative skill : 20 %
Final presentation and report : 30 %

[Textbooks]

There will be weekly handouts.

[References]

[Schedule]

Through the first part of this course, you will learn basic notions of narrative methods in terms of meaning and form as well as those of cultural history.
In the second part, you will be asked to give a presentation in order to prepare for the final presentation about a theme which you will decide.　Some sessions will take the form of a seminar or even one on one discussion.

[Title]			[Instructor]		
Information Visualization			Xiaoyang Mao / Hidetoshi Ando		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414570	2	Human Environment Medical Engineering	2nd Semester	Mon.／IV	English／Japanese

[Outline and purpose]

Information visualization is a technology for enabling users to understand complex phenomena by presenting abstract concept or large simulated dataset in a visual and intuitive way. The course covers the basic concepts, fundamental algorithms and advanced topics of modern computer visualization technologies. The course will be mainly taught in an interactive style by referring to recently published research papers.

[Objectives]

1. Understanding the basic concept and terminologies f computer visualization
2. Understanding the major visualization algorithms
3. Knowing the newest research trend of computer visualization

[Requirements]

Knowledge about basic algorithms of computer graphics and image processing.

[Evaluation]

Students will be asked to write a survey paper on a research topic related to visualization

[Textbooks]

None

[References]

Recently published research papers which will be specified by the instructors during the course.

[Schedule]

1.Introduction
2.Perception and visualization
3.Introduction to scientific visualization
4.Scalar field visualization
5.Vector field visualization
6.Tensor field visualization
7.Information visualization
8.Focus+context approach
9.Image based approach
10. Data reduction
11.Interaction techniques
12.Real time visualization
13.GPU based acceleration
14.GPU based scalar and vector field visualization
15.GPU based data analysis and visualization

[Title]			[Instructor]		
Advanced Study on Artificial Intelligence			Koji Iwanuma / Fumiyo Fukumoto / Hidetomo Nabeshima		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414580 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／V	Japanese

[Outline and purpose]

Considering information as a product of computational process began in the mid-20th century. Such a standpoint validates that one of the foundations of computer science is a mathematical theory of symbolic computation. For example, data mining technologies derives a new knowledge from a flood of information, and extracts important information from the very large scale text data. The purpose of this course is to understand information from the viewpoint of computational process. This course consists of three parts. The first part is for transactional/sequential data mining. Part two addresses the issue of the semantics of natural languages, and introduces computational models of the interpretation of semantics. The last part of the course introduces Boolean satisfiability testing (SAT) which is one of important subjects in computer science, and shows the state-of-the-art techniques of modern SAT solvers and their various application areas. The course shows the latest case study in each topic and discusses the current status and challenges.

[Objectives]

1. To understand the basics and state-of-the-art of data mining techniques for discrete data, web intelligence.
2. To understand the basics and state-of-the-art of statistical natural language semantics.
3. To understand the basics and state-of-the-art of Boolean propositional satisfiability testing and its applications.

[Requirements]

A grounding in algorithms and data structure, information theory and discrete mathematics.

[Evaluation]

Homework: 100%

[Textbooks]

[References]

[Schedule]

1. Data-mining: basic concepts of association analysis for transaction databases
2. Data-mining: the second-generation technology for transaction data mining
3. Data-mining: basic concepts of sequential data mining
4. Data-mining: online sequential data mining
5. Data-mining: the state-of-art technology for structural data mining
6. Theories in semantics : formal semantics, lexical semantics and conceptual semantics
7. Acquisition techniques: rule-based, example-based, and corpus-based techniques
8. Acquisition of semantics: synonyms, antonyms, polysemy, and bilingual word expressions
9. Metaphor: metaphor and conceptual metaphor
10. Application: machine translation, information retrieval, question answering, and summarization
11. Foundations of Boolean satisfiability testing
12. Principles of modern SAT solvers
13. Constraint optimization problems and SAT encodings
14. SAT planning and SAT scheduling
15. SAT-based system verification

[Title]			[Instructor]		
Advanced Study on Artificial Intelligence			Koji Iwanuma / Fumiyo Fukumoto / Hidetomo Nabeshima		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414580 B	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／VI	Japanese

[Outline and purpose]

Considering information as a product of computational process began in the mid-20th century. Such a standpoint validates that one of the foundations of computer science is a mathematical theory of symbolic computation. For example, data mining technologies derives a new knowledge from a flood of information, and extracts important information from the very large scale text data. The purpose of this course is to understand information from the viewpoint of computational process. This course consists of three parts. The first part is for transactional/sequential data mining. Part two addresses the issue of the semantics of natural languages, and introduces computational models of the interpretation of semantics. The last part of the course introduces Boolean satisfiability testing (SAT) which is one of important subjects in computer science, and shows the state-of-the-art techniques of modern SAT solvers and their various application areas. The course shows the latest case study in each topic and discusses the current status and challenges.

[Objectives]

1. To understand the basics and state-of-the-art of data mining techniques for discrete data, web intelligence.
2. To understand the basics and state-of-the-art of statistical natural language semantics.
3. To understand the basics and state-of-the-art of Boolean propositional satisfiability testing and its applications.

[Requirements]

A grounding in algorithms and data structure, information theory and discrete mathematics.

[Evaluation]

Homework: 100%

[Textbooks]

[References]

[Schedule]

1. Data-mining: basic concepts of association analysis for transaction databases
2. Data-mining: the second-generation technology for transaction data mining
3. Data-mining: basic concepts of sequential data mining
4. Data-mining: online sequential data mining
5. Data-mining: the state-of-art technology for structural data mining
6. Theories in semantics : formal semantics, lexical semantics and conceptual semantics
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9. Metaphor: metaphor and conceptual metaphor
10. Application: machine translation, information retrieval, question answering, and summarization
11. Foundations of Boolean satisfiability testing
12. Principles of modern SAT solvers
13. Constraint optimization problems and SAT encodings
14. SAT planning and SAT scheduling
15. SAT-based system verification

[Title]			[Instructor]		
Advanced Medical Engineering I			Keiji Sonoya / Hatsuhiro Kato / Kazuya Ogawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414760 A	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Mon.／V	English／Japanese

[Outline and purpose]

We arrange our purpose by individual research object.

[Objectives]

We arrange our purpose by individual research object.
Final goal is to advance the medical and engineering field to even higher level.

[Requirements]

Basic technology of medical and engineering field.

[Evaluation]

Presentation　60%
Research attitude　40%

[Textbooks]

We do not indicate text book, but we can select textbooks depending on research object.

[References]

We do not indicate references, but we can select references depending on research object.

[Schedule]

These will be decided by research schedule.
Lectures by Kato
(1) Semiconductor material and device features
(2) Features on neurons
(3) Design of integrated circuits
(4) Emulation of bio-system by silicon devices
(5) CMOS bio-sensors
(6) Recent advancement of the bio-system
by Ogawa
(1) laser medical care
(2) cancer treatments by DDS and PET
(3) artificial biomaterials
(4) ion channel
(5) artificial enzyme
(6) artificial photosynthesis

[Title]			[Instructor]		
Advanced Medical Engineering I			Keiji Sonoya / Hatsuhiro Kato / Kazuya Ogawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414760 B	2	Human Environment Medical Engineering Life Information Systems Course	1st Semester	Mon.／VI	English／Japanese

[Outline and purpose]

We arrange our purpose by individual research object.

[Objectives]

We arrange our purpose by individual research object.
Final goal is to advance the medical and engineering field to even higher level.

[Requirements]

Basic technology of medical and engineering field.

[Evaluation]

Presentation　60%
Research attitude　40%

[Textbooks]

We do not indicate text book, but we can select textbooks depending on research object.

[References]

We do not indicate references, but we can select references depending on research object.

[Schedule]

These will be decided by research schedule.
Lectures by Kato
(1) Semiconductor material and device features
(2) Features on neurons
(3) Design of integrated circuits
(4) Emulation of bio-system by silicon devices
(5) CMOS bio-sensors
(6) Recent advancement of the bio-system
by Ogawa
(1) laser medical care
(2) cancer treatments by DDS and PET
(3) artificial biomaterials
(4) ion channel
(5) artificial enzyme
(6) artificial photosynthesis

[Title]			[Instructor]		
Advanced Medical Engineering II			Kazuyuki Uno / Satomi Ogawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414770	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／V	Japanese

[Outline and purpose]

Surface piezoelectric sensor is widely used in the Medical and Biological research, for the detection of small-scale amount of chemical compounds. Basics of piezoelectric oscillation and signal processing, circuit design and application are introduced and discussed.

A capacitive sensor is widely used to detect such physical quantities as pressure difference, rotational angle, linear displacement, and acceleration. Basics of capacitive sensor, sensor signal processing, design of integrated circuits, and applications of capacitive sensors are introduced and discussed in this course.

[Objectives]

1. To understand the basic technologies and applications of the piezoelectric, bio-electric sensor.

2. To understand the basic technologies and applications of the capacitive sensor.

[Requirements]

Groundings in physics and mathematics as well as basic knowledge on electronics.

[Evaluation]

Presentation 100%

[Textbooks]

We do not indicate text book. Required literatures will be supplied during the course.

[References]

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley and Sons, Inc., ISBN: 978-0-470-39877-7
2. Larry K. Baxter, Capacitive Sensors Design and Applications, IEEE Press, ISBN:078035351X

[Schedule]

Piezoelectric sensor and stability of oscillation
1. Basics of Quartz Crystal Oscillators
2. Sensor signal processing
3. Design of sensor-electronics circuit.
4. Application and hands-on experiment of piezoelectric oscillators/ sensors.

Capacitive sensors and its applications:
1. Basics of capacitive sensor
2. Sensor signal processing
3. Design of integrated circuits and components
4. Applications and examples of capacitive sensors

[Title]			[Instructor]		
Advanced Laser Medicine			Kazuyuki Uno		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
414780 A	2	Human Environment Medical Engineering Life Information Systems Course	2nd Semester	Thu.／VI	Japanese

[Outline and purpose]

This course provides an introduction to laser devices, laser technology, and their medical applications. This course covers some basics of electromagnetic waves, photons and light parameters, and also discusses the basic principles of laser oscillation and laser beam properties, and gives adequate details on some of the prominent lasers for medical applications. This course will cover also some laser treatment and therapy processes, and laser safe handling.

[Objectives]

Students completing the course will
1. be able to explain about the elements of laser technology.
2. be able to explain about the elements of laser medicine.

[Requirements]

Requirements for admission to the course are basic knowledge of optics and physics.

[Evaluation]

Presentation and discussion 100%

[Textbooks]

[References]

[Schedule]

1. Laser
2. Laser medicine
3. CO_2 laser
4. CO_2 laser medicine
5. Lab course of CO_2 laser
6. Presentation and discussion
7. UV laser and excimer laser
8. UV laser and excimer laser medicine
9. Lab course of UV laser and excimer laser
10. Presentation and discussion
11. Solid state laser and diode laser
12. Solid state laser and diode laser medicine
13. Lab course of Solid state laser and diode laser
14. Presentation and discussion
15. Presentation and discussion