

## “Exercises in Medical Sciences (A6)” and “Study in Medical Sciences (A7)”

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<b>A6 Exercises in Medical Sciences: Anatomy</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisors: Takaichi Fukuda Program schedule: year 1-2, every Wednesday (1st period) Site and Facilities: seminar room and laboratories at Department of Anatomy	
<p><b>【Course Description】</b> Every physiological function <i>in vivo</i> requires particular anatomical structures for its execution. Morphological and functional aspects are inseparably related to each other within the body such that morphological approaches still constitute the essential part of the biomedical science. This Department Course focuses on the tissue architecture of the central nervous system, particularly on several critical components of the system such as cytoarchitecture, synapses, neuronal gap junctions, dendrites and spines. Students are instructed for necessary experimental techniques including electron microscopy, confocal laser scanning microscopy, computer-based 3D-reconstruction/analysis of the structure, and unbiased morphometry (stereology), through intensive reading of the representative literatures, lectures, and discussion on the research activities of individual students.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed and reports submitted.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following issues: 1) the ability of critical reading of the representative papers, 2) knowledge on the principles of major morphological techniques and the ability to deduce the appropriate conclusion from the obtained data, 3) the ability to explain the significance of their own study from the historical perspective.</p>	

<b>A7 Study in Medical Sciences: Anatomy</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisors: Takaichi Fukuda Program schedule: year 1-2, every Wednesday (3rd periods) Site and Facilities: seminar room and laboratories at Department of Anatomy	
<p><b>【Course Description】</b> Students are instructed for execution of the experiment through the skilled morphological techniques. They learn to prepare high-quality specimens for histology, to operate EM and CLSM with the highest resolution, and to observe and interpret the structure for an in-depth analysis. Obtained results should be presented in scientific meetings and journals.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their achievements in experimental skills, validity of their interpretation of the obtained data and conclusions, and publications.</p>	
<p><b>【Evaluation Criteria】</b> The following criteria must be satisfied: 1) acquisition of principal experimental skills for morphology, 2) appropriate analysis of the obtained results, 3) publication in high-quality journal(s).</p>	

**A6 Exercises in Medical Sciences:  
Histology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Tomohiko Wakayama  
Program Schedule: year 1-2,  
Site and Facilities: seminar rooms and laboratories at Department of Histology

**【Course Description】**

Histology is the study of the tissues of the body for human and experimental animals. Students will learn how these tissues are arranged to constitute organs of their bodies. In order to study histology, histochemistry is one of powerful tools. Histochemistry is used mainly to indicate methods for visualize the expression and cellular localization of a variety of biological molecules in tissue sections. Students will learn several procedures to obtain the information based on enzymatic reactions, antigen-antibody reactions, or nucleic-acid hybridization. Students also will learn how to read representative histochemical literatures and discuss their contents.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed and oral presentation and reports.

**【Evaluation Criteria】**

The evaluation will be done based on the following issues.

- 1) The ability to read the representative literatures in English.
- 2) Acquisition of knowledge on principles and skills of histochemical techniques.

**A7 Study in Medical Sciences:  
Histology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Tomohiko Wakayama  
Program Schedule: year 1-2  
Site and Facilities: seminar rooms and laboratories at Department of Histology

**【Course Description】**

Students will acquire several histochemical techniques to analyze biological molecules by morphology. They will learn to prepare and observe tissue specimens for histochemistry in light and electron microscopy. They should present obtained results in scientific meeting and journals.

**【Evaluation for Grades and Credits】**

Students are evaluated based on the acquisition of histochemical skills and reports. The reports can be substituted by publication of scientific papers, presentations in scientific meetings, or progress reports in laboratory meetings.

**【Evaluation Criteria】**

Evaluation will be done based on the following criteria.

- 1) Acquisition of histochemical techniques for analyses the expression and cellular localization of a variety of biological molecules.
- 2) Research progression based on the data obtained by experiments.
- 3) Publication in high-quality journal(s).

**A6 Exercises in Medical Sciences:  
Sensory and Cognitive Physiology**

**Subject Code 10060  
(Required; 8 credits)**

Supervisor: Wen-Jie Song, Makoto Takemoto, Masataka Nishimura, Ryohei Tomioka

Program Schedule: year 1-2, every Friday (1st period)

Site and Facilities: seminar room and laboratories at Department of Sensory and Cognitive Physiology

**【Course Description】** Sensory perception is a major brain function, and still remains to be a major research subject of neuroscience. Sensory information is first sensed and transformed by peripheral organs into neuronal activities. Neuronal activities are further transformed along subsequent afferent pathways. We now know that our brain processes sensory information in an analytical manner. We will learn in this class mechanisms of sensory information processing at the molecular, cellular, and system level, through reading research articles that have significantly advanced our understanding of sensory information processing. Meanwhile, methods used for sensory physiology research will be thoroughly discussed. Students are then required to make their own plan of auditory research, using electrophysiological or optical approaches. The supervisors will give advice on the design and execution of experiments, and also on the analyses and publication of research results.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned on recent progress in sensory physiology and neuroscience, and their ability in design and execution of research projects as well as in interpretation of research results. Publications of research articles or meeting abstracts and presentations at lab meetings, are also taken into account for evaluation.

**【Evaluation Criteria】** A successful student must

- 1) be highly motivated in conducting proper design and execution of experiments that are anticipated to advance our understanding of auditory neuroscience, and
- 2) have developed skills in scientific communication, and
- 3) have obtained novel findings on neural basis of auditory perception, or
- 4) have obtained novel findings on neuronal mechanisms of acoustic information processing, or
- 5) have obtained novel findings on molecular mechanisms of sensory information processing.

**A7 Study in Medical Sciences:  
Sensory and Cognitive Physiology**

**Subject Code 10070  
(Required; 8 credits)**

Supervisor: Wen-Jie Song, Makoto Takemoto, Masataka Nishimura, Ryohei Tomioka

Program Schedule: year 1-2, every Monday (1st periods)

Site and Facilities: seminar room and laboratories at Department of Sensory and Cognitive Physiology

**【Course Description】** The aim of this class is for the students to acquire techniques required for cellular and system neurophysiology. Specifically, students are required to master 1) techniques for preparing acute or chronic animal models for sensory physiology research, and 2) patch clamp recording at all configurations through investigation of ion channels and receptors, or 3) in vivo intracellular and extracellular recording techniques through experimental analyses of cellular physiology and neuronal circuit properties, or 4) optical imaging and psychophysical techniques through experiments in auditory perception.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】**

A successful student must

- 1) have gained the ability of preparing acute or chronic animal models for sensory physiology research, and
- 2) have mastered patch-clamp techniques for the analyses of ion channels and receptors, or
- 3) have mastered intracellular or extracellular recording techniques for sensory neurophysiology, or
- 4) have mastered optical imaging techniques for auditory physiology, or
- 5) have mastered psychophysical techniques for addressing problems in auditory perception.

**A6 Exercises in Medical Sciences:  
Molecular Physiology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kazuhito Tomizawa  
Program Schedule: year 1-2, every Wednesday (1st period)  
Site and Facilities: Seminar room and laboratories at Department of Molecular Physiology

**【Course Description】** The balanced functioning of physiological processes and maintenance of an organism's internal environment within a narrow range are important for the survive of life. Hormones and central nervous system are involved in the regulation of homeostasis. The aim of this Departmental Course is to learn how to propose scientific hypothesis for novel molecular mechanisms of the regulation of homeostasis. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for the acknowledgement of pathophysiology of some diseases and prevention and treatment of the diseases. Specific research projects to be executed should be determined by searching latest literatures related to the molecular physiology. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of physiology, pathophysiology, molecular biology and cell biology. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for molecular physiology and pathophysiology, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into account for evaluation.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the molecular mechanism on regulation of homeostasis by hormone and central nervous system.
- 2) Understanding how to investigate molecular mechanism of the regulation of homeostasis.
- 3) Logical/proper experimental design to clear the mechanism of the regulation of homeostasis.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for molecular mechanism on homeostasis but also to successful development of diagnosis, prevention, and treatment of various diseases.

**A7 Study in Medical Sciences:  
Molecular Physiology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kazuhito Tomizawa  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: Seminar room and laboratories at Department of Molecular Physiology

**【Course Description】** The aim of this class is to acquire the techniques to examine molecular mechanism on the regulation of homeostasis. Specifically, students are required to master 1) techniques for cell culture and functional regulation of cultured cells using gene transfection and protein transduction, 2) isolation of pancreatic  $\beta$  cells and the culture, 3) optical imaging techniques such as intracellular  $Ca^{2+}$  imaging, 4) physiological analyses in vivo, and 5) molecular analyses for signal transduction such as protein phosphorylation.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to study RNA biology.
- 2) Acquisition of making research plan and performing the study.
- 3) Acquisition of experimental techniques to image intracellular signaling such as calcium.
- 4) Acquisition of experimental techniques for physiological analyses in vivo.
- 5) Acquisition of experimental skills to investigate signal transduction such as protein phosphorylation.

**A6 Exercises in Medical Sciences:  
Cell Signaling and Metabolic Medicine  
(Required: 8 credits)**

**Subject Code 10060**

Supervisor: Toshiro MOROISHI  
Program Schedule: year 1-2, every Monday (1st period)  
Site and Facilities: Laboratory of Cell Signaling and Metabolic Medicine

**【Course description】** The aim of this course is to understand the biological phenomena regulated by intracellular signaling pathways and metabolism. Students will read latest research papers and attend the lab meeting, scientific seminars, or research conferences, to acquire skills required for scientific discussion. Students will be trained to understand biological phenomena at the level of molecules, cells, and a body. The goal of this course is to learn scientific knowledge and techniques that are essential for conducting basic research. In addition, students are encouraged to propose reasonable research projects under the supervision of mentors (senior researchers in the lab).

**【Evaluation for Grades and Credits】** To get evaluation, the students need to be trained and involved in research activities enough to achieve the above mentioned goals. We will make a general judgement based on the students' level of understanding on their research projects during lab meeting and daily research discussions, as well as paper publication and research presentation at the conferences.

**【Evaluation Criteria】** The students will be evaluated based on the following points.  
(1) Efforts of conducting research.  
(2) Skills of reading and understanding latest research papers.  
(3) Understanding on general experimental methods for basic research.  
(4) Logic of experimental design for the research project (under the supervision of mentors).

**A7 Study in Medical Sciences:  
Cell Signaling and Metabolic Medicine  
(Required: 8 credits)**

**Subject Code 10070**

Supervisor: Toshiro MOROISHI  
Program Schedule: year 1-2, every Monday (1st period)  
Site and Facilities: Laboratory of Cell Signaling and Metabolic Medicine

**【Course description】** The aim of this course is to learn experimental techniques for leading research projects that students designed in the "Exercises in Medical Sciences" course. Students will learn about molecular biology and biochemistry (DNA, RNA, and proteins), cell biology (molecular imaging, genome editing, phenotypic analysis), and genetics (mouse). Students are encouraged to learn about basic research aiming to understand the biological phenomena regulated by intracellular signaling pathways and metabolism. Students will learn how to write a research report and how to give a scientific presentation.

**【Evaluation for Grades and Credits】** To get evaluation, the students need to be trained and involved in research activities enough to achieve the above mentioned goals. We will make a general judgement based on the students' level of understanding on their research projects and their experimental skills. Students will give a presentation at the lab meeting and express their opinion during daily research discussions.

**【Evaluation Criteria】** The students will be evaluated based on the following points.  
(1) Efforts of conducting research.  
(2) General experimental skills for basic research.  
(3) Design and progress on the research project (under the supervision of mentors).  
(4) Logic of data interpretation and research discussion.

**A6 Exercises in Medical Sciences:  
Medical Biochemistry**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kazuya Yamagata, Tatsuya Yoshizawa  
Program Schedule: year 1-2, every Monday (4th period)  
Site and Facilities: Seminar room and laboratories at Medical Biochemistry

**【Course Description】** The aim of this course is to clarify novel metabolic pathways and investigate the molecular mechanisms of diabetes mellitus, metabolic syndrome or atherosclerosis by using biochemical and cellular biological approaches. The obtained results should be reported in scientific journals and scientific meeting. Students will be conducted how to proceed the processes in this Departmental Course.

**【Evaluation for Grades and Credits】** Students will be comprehensively assessed by the ability of understanding and discussing on related literatures to the project, ability of proposing research project, accuracy of experiments, interpretation of experimental results, and presentation/reports in the course. Research article or presentation in the scientific meeting is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Acquisition of the latest knowledge on mechanism of glucose and lipid metabolism regulation and pathology of diabetes. Obtaining novel findings by appropriate and proper experimental approaches.  
2) Acquisition of the latest knowledge on mechanism of metabolic syndrome or atherosclerosis development/progression. Obtaining novel findings by appropriate and proper experimental approaches.  
3) Acquisition of the latest knowledge of the basic research on developing novel remedies for diabetes, metabolic syndrome and atherosclerosis and their clinical applications. Obtaining novel findings by appropriate and proper experimental approaches.

**A7 Study in Medical Sciences:  
Medical Biochemistry**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kazuya Yamagata, Tatsuya Yoshizawa  
Program Schedule: year 1-2, every Friday (4th periods)  
Site and Facilities: Seminar room and laboratories at Medical Biochemistry

**【Course Description】** The aim of this practical course is to acquire various biochemical, cellular biological and molecular biological experimental technique required for investigating pathogenesis of glucose and lipid metabolism regulation or cardiovascular lesion development/progression resulting from diabetes, metabolic syndrome or atherosclerosis, and for proposing novel therapeutic strategy for these diseases.

**【Evaluation for Grades and Credits】** Students will be comprehensively assessed based on course hours completed, acquisition of experimental skills and reports. Research article or presentation in the scientific meeting will be occasionally approved as a report for grades and credits.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Understanding and acquisition of biochemical, cellular biological and molecular biological experimental methods for analysis of diabetes, metabolic syndrome or atherosclerosis.  
2) Ability of proposing and carrying out appropriate plan for research subjects in the field of metabolic medicine.

<b>A6 Exercises in Medical Sciences: Molecular Genetics</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
<p>Supervisor: Yuichi Oike, Kazutoyo Terada, Tsuyoshi Kadomatsu, Keishi Miyata, Michio Sato, Haruki Horiguchi  Program Schedule: year 1-2, every Tuesday (1st period)  Site and Facilities: staff room and laboratories at Department of Molecular Genetics, as a general rule</p>	
<p><b>【Course Description】</b> The aim of this Departmental Course is to learn how to propose scientific hypothesis for the roles of the gene products, which are associated with metabolic disorders, stress response, protein quality control or apoptosis. The hypothesis must then be proven by in vitro, in vivo or individual level experiments. Further experiments using corresponding gene-knockout mice will be designed and performed to examine the biological functions of those gene products in tissue or whole body levels. Finally, the experimental results should be reported in academic meeting and international scientific journal. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for the fields, which are related to our Department. In addition, the ability for experimental planning, interpretation and criticism of the results obtained, are also evaluated on oral presentation, reports and so on. The scientific article, presentation at the academic meeting or progress reports at the department meeting are also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Understanding the experimental procedures concerning molecular genetics, metabolomics and molecular cell biology.</li> <li>2) Proposal of appropriate research projects on the basis of understanding the background on molecular genetics, metabolomics and molecular cell biology.</li> <li>3) Logical and proper experimental design to execute proposed projects.</li> <li>4) Obtaining current information concerning molecular genetics, metabolomics, molecular cell biology, and furthermore original and innovative findings.</li> </ol>	

<b>A7 Study in Medical Sciences: Molecular Genetics</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
<p>Supervisor: Yuichi Oike, Kazutoyo Terada, Tsuyoshi Kadomatsu, Keishi Miyata, Michio Sato, Haruki Horiguchi  Program Schedule: year 1-2, every Monday (1st period)  Site and Facilities: staff room and laboratories at Department of Molecular Genetics, as a general rule</p>	
<p><b>【Course Description】</b> The aim of this class is to acquire the techniques, using animals like mice, tissue or cultured cells, to perform experiments concerning molecular biology, molecular cell biology, biochemistry and histochemistry. Using these techniques, students are instructed to plan, and to execute experiments to clarify the biological roles of genes and their products, which are supposed to be involved in metabolic disorders, stress response, protein quality control or apoptosis.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's scientific article, presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria, in response to each student's research project.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills, using cultured cells, concerning molecular biology, molecular cell biology and biochemistry.</li> <li>2) Acquisition of experimental skills, using tissue and whole body, concerning molecular biology, biochemistry and histochemistry.</li> <li>3) Proposal of appropriate research projects on the basis of understanding the background on molecular genetics, metabolomics and molecular cell biology.</li> <li>4) Planning and executing logical and proper experimental design to proposed projects.</li> </ol>	



**A6 Exercises in Medical Sciences:  
Tumor Genetics and Biology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Norie Araki  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Tumor Genetics and Biology

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the specific molecular mechanisms of tumor cells (including its stem cells) compared with normal cells, especially on the cell cycle, differentiation, and apoptosis. Recent scientific literatures related to the subject of tumor genetics, molecular and cellular biology will be searched and studied in detail, that is, how to proposed the hypothesis based on the back ground, create experimental evidences, and discuss and prospect on the original and innovative findings. The specific research projects demonstrated must be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for understanding of tumor related diseases. Finally, the experimental results should be reported in international scientific journals in the fields of oncology, biochemistry, molecular biology, and/or cell biology, All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for tumor genetics and biology, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding how to investigate the differences of molecular mechanisms between tumor cells, tumor stem cells and normal cells, especially on the cell cycle, differentiation, and apoptosis.
- 2) Understanding how to investigate the molecular function of tumor related molecules in tumor cells by the methods of molecular biology and cell biology such as their over expressions or knock down strategies.
- 3) Proposal of appropriate research projects and experimental design on own thesis subject.
- 4) Novel findings obtained on the abnormal cellular and molecular functions in tumor cells.
- 5) Proper discussion and review on the original findings obtained.
- 6) Paper publication and oral presentation on own original findings in the thesis subject with proper discussion against the questionnaires.

**A7 Study in Medical Sciences:  
Tumor Genetics and Biology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Norie Araki  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at Department of Tumor Genetics and Biology

**【Course Description】** The aim of this class is to acquire the techniques to analyze molecular mechanism and cellular biology of tumor and its stem cells. Specifically, experimental techniques to be earned in this course include establishment of experimental tumor cellular models after overexpression or knockdown of particular tumor related molecules, and comprehensive screening of tumor related cellular molecules with proteomic differential display, such as 2-Dimensional differential gel electrophoresis with specific fluorescent dyes (2D-DIGE), nanoLC-shotgun based differential proteomics (iCAT, iTRAQ4-plex, 8-Plex) that were newly established in this department, using nano-LC tandem MS (ESI-QQTOF, ESI-QQQ, MALDI-TOF-TOF, DNA array), with the highest sensitivity, resolution, and throughput. Particular emphasis is placed also on and advanced techniques to investigate intracellular signal transduction, tumor cellular observation with time laps-confocal microscopic analysis, bioinformatics on tumor related molecules and so on, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to analyze cellular biology, molecular biology, biochemistry on tumor cells, that is, cell culture, microscopic analysis, DNA/RNA preparation, PCR, DNA cloning/sequences, plasmid construction/overexpression, siRNA/knockdown, western blotting, immuno-precipitation, protein purification/indentification/sequensing, 2D-PAGE, MAS-spectrometry, nano-HPLC operation, molecular information mining methods, and so on.
- 2) Understanding how to analyze the differentially expressed gene and protein in tumor and its stem cells.
- 3) Execution of experimental techniques to the proposed research projects and proper construction of experimental design on own thesis subject.

**A6 Exercises in Medical Sciences:  
Cell Pathology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Yoshihiro Komohara, Yukio Fujiwara  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Cell Pathology

**【Course Description】** The aim of this Departmental Course is to learn morphological and functional changes of the cells induced by various pathological processes including metabolic disorders, circulatory disturbances, inflammation, or tumorigenesis. For this purpose students will have an opportunity to examine pathological changes of human tissues obtained at biopsy, surgical operation or autopsy. To pursue detailed disease process of a selected disease, students are requested to plan and conduct their own research project. During their own research process the students will learn the fundamental skills for pathological diagnosis, ultrastructural observation, cell culture, handling of animals, cell biology and molecular biology. Worldwide information should be collected through scientific literatures to execute their own original research projects. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of the research. Finally, the experimental results should be reported in international scientific journals in the fields of pathology, biochemistry, cell biology or molecular biology. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the following points. Their understanding and knowledge earned about scientific information on recent progress of pathological process for a targeted disease, and ability for experimental planning and interpretation and criticism of the results obtained are subjects for evaluation. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Ability to explain and evaluate pathological changes of tissue specimens at cellular and tissue levels.
- 2) Understanding of fundamental techniques to perform pathological experiments.
- 3) Ability to design the experiments to clarify cellular and molecular pathogenesis of a selected disease process.
- 4) Ability to propose original research data and discuss according to the recent progress of the research field concerned.

**A7 Study in Medical Sciences:  
Cell Pathology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Yoshihiro Komohara, Yukio Fujiwara  
Program Schedule: year 1-2, every Monday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Cell Pathology

**【Course Description】** The aim of this class is to acquire the techniques to analyze disease process. These techniques include processing of histopathological specimens, immunohistochemical analysis, confocal laser microscopy, electron microscopy, production of monoclonal antibodies, establishment of animal disease models, and various techniques of molecular biology. Particular emphasis is placed on the techniques to evaluate macrophage functions in various pathological conditions. These include detection of macrophages in pathological tissue specimens, isolation and culture of human and animal macrophages, functional evaluation of macrophage-specific receptors, intracellular processing of phagocytosed materials, detection of cytokines produced by macrophages, and signal transduction pathway during macrophage activation. All of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of fundamental experimental skills to conduct pathological examination.
- 2) Understanding how to obtain and process pathological specimens.
- 3) Knowledge about basic techniques of cellular and molecular biology to evaluate functional molecules during pathological process.
- 4) Acquisition of experimental skills to evaluate gene expression of macrophage-related molecules.
- 5) Ability to design the suitable experimental methods to obtain new information.

**A6 Exercises in Medical Sciences:  
Microbiology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Tomohiro Sawa, Yosuke Maeda  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Microbiology

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of molecular pathogenesis of infectious disease and host defense. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for prevention and treatment of infectious diseases. Specific research projects to be executed should be determined by searching latest literatures related to the microbial pathogenesis and host defense. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of microbiology, biochemistry, molecular biology, cell biology, and/or infectious diseases. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for microbial pathogenesis and host defense mechanism, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the microbial pathogenesis and host defense mechanisms.
- 2) Understanding how to investigate molecular pathogenesis and host defense for microbial infections.
- 3) Logical/proper experimental design to identify the pathogenic and host defense factors.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for microbial pathogenesis and host defense but also to successful development of diagnosis, prevention, and treatment of various diseases.

**A7 Study in Medical Sciences:  
Microbiology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Tomohiro Sawa, Yosuke Maeda  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Microbiology

**【Course Description】** The aim of this Jissen II is to acquire the techniques to analyze host responses to various pathogenic bacteria and virus during infections. Specifically, experimental techniques to be earned in this course include establishment of experimental infection models of animals, such as mice and rats, and cultured cells, and analysis of various signaling factors and host defense molecules produced in cells and tissues. Particular emphasis is placed also on safe and proper handling of various pathogens (culture methods etc.), identification and analysis of toxins, analytical methods for reactive oxygen species, free radicals, and nitric oxide (NO), proteomics/metabolomics (LC-MS/MS etc.), development of well-characterized infection models with cultured cells and experimental animals, and advanced techniques to investigate intracellular signal transduction, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models for infectious diseases.
- 2) Understanding how to detect and identify bacterial toxins, and determine their biological activities.
- 3) Acquisition of experimental techniques to produce recombinant genes and proteins of various microbial factors and host defense molecules, so that their structures and functions can be accurately analyzed and understood.
- 4) Understanding of chemical reactivities, biological functions, identification/detection methods of reactive oxygen species and NO.
- 5) Acquisition of experimental skills to investigate signal transduction mechanisms in the various infectious animal models.

**A6 Exercises in Medical Sciences:  
Immunology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Hiroyuki Oshiumi, Hirotake Awai  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Immunology

**【Course Description】** Recently, it is necessary to clarify the principle through a new immunity that controls and strengthens the immune reaction when applying it to an actual medicine and the medical treatment. To establish a molecular basis of the immunity control, the research program is actually planned and practiced aiming to verify the feasibility based on the experimental result that has been clarified so far and to develop a new advanced approach and technology. Studying the acquired immunity, particularly regarding the deteriorated immune reaction of humoral immunity with abnormality of cellular, molecular and genetic factors using the various gene-altered animals elucidates the basis of the immune system. Through the further investigation of the individual abnormality of the immune system, the knowledge, the experimental skill, and the research activity develop for a mature scientist participating in the international academic and research fields.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, understanding and knowledge earned about scientific information on recent progress in the research for immune system and host defense mechanism, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the immune system and host defense mechanism.
- 2) Understanding how to investigate molecular mechanism of allergy and autoimmunity.
- 3) Logical/proper experimental design to identify the abnormality in the immune system against various microbial infections and cancer.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute to better understanding for the immuno-manipulation.

**A7 Study in Medical Sciences:  
Immunology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Hiroyuki Oshiumi, Hirotake Awai  
Program Schedule: year 1-2, every Wednesday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Immunology

**【Course Description】** The aim of this class is to acquire various experimental techniques in immunology, biochemistry, and molecular biology to study the molecular basis of various diseases associated with the impairment of the immune system such as allergy and autoimmune diseases. Three kinds of experimental techniques are trained: (1) molecular analysis, (2) cellular and signal transduction analyses for the study of functions of genes and proteins in cells, (3) the individual body responses based on the gene-targeted mice. They include general molecular biology techniques regarding genome and cDNA analyses, cloning of DNAs, identification and localization of the specific molecules, and the analysis of molecular functions in the animals. Genetic alteration in mouse ES cells and its application are used for the study of molecular function in the development of mouse. Immunological techniques include establishment of high-affinity monoclonal antibodies against cellular and humoral components, immunofluorescent visualization of specific molecules in cells, and application to flow cytometric analysis and cell separation. Immune responses and the occurrence of tumors or autoimmunity are observed in the experimental animal model, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models of autoimmunity, allergy, and cancer.
- 2) Understanding how to detect and identify immuno-regulatory molecules, and determine their biological activities.
- 3) Acquisition of experimental techniques to produce recombinant genes and proteins of various immunological factors and host defense molecules, so that their structures and functions can be accurately analyzed and understood.
- 4) Understanding of chemical reactivities, biological functions, identification/detection methods of immunoregulators.
- 5) Acquisition of experimental skills to investigate signal transduction mechanisms in the various autoimmune and cancer models.

<b>A6 Exercises in Medical Sciences: Molecular Brain Science</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisor: Kazuya Iwamoto Program schedule: year 1-2, every Wednesday (1st period) Site and Facilities: Seminar room and laboratories at Department of Molecular Brain Science	
<b>【Course Description】</b>	
The aim of this Course is to learn how to propose scientific hypothesis for molecular pathophysiology of psychiatric disorders and brain function. Then the relevant research projects to be executed should be planned by searching the latest literatures and through extensive discussion. Research projects and working hypothesis would be modified and improved depending on the progress and achievement. Finally, the experimental results should be reported in international scientific journals. All instructions in the above-mentioned processes will be conducted in this Course.	
<b>【Evaluation for Grades and Credits】</b>	
Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the relevant research fields, and ability for planning the research project. The presentation including discussion at the laboratory is also taken into account for evaluation.	
<b>【Evaluation Criteria】</b>	
The achievement will be evaluated according to the following criteria. 1) Understanding how to investigate the basic problems on molecular psychiatry and molecular neuroscience. 2) Proposing the appropriate research projects on the basis of understanding the background on the molecular psychiatry and molecular neuroscience. 3) Obtaining the novel findings by appropriate and proper analytical approaches.	

<b>A7 Study in Medical Sciences: Molecular Brain Science</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisor: Kazuya Iwamoto Program schedule: year 1-2, every Wednesday (1st period) Site and Facilities: Seminar room and laboratories at Department of Molecular Brain Science	
<b>【Course Description】</b>	
The aim of this class is to acquire the practical experimental and bioinformatic techniques to examine the pathophysiology of psychiatric disorders and brain functions. Example techniques required are basic molecular and cellular biological methods, animal and cell manipulation, programming skills such as R and Linux-based software.	
<b>【Evaluation for Grades and Credits】</b>	
Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.	
<b>【Evaluation Criteria】</b>	
The achievement will be evaluated according to the following criteria. 1) Acquisition of experimental and bioinformatics skills required for solving the problems on molecular psychiatry and molecular neuroscience.	

<b>A6 Exercises in Medical Sciences: Aging and Longevity Research</b> Supervisor: Kyoko Miura Program schedule: Site and Facilities: Held mostly in the Laboratory of Aging and Longevity Research	<b>Subject Code 10060 (Required: 8 credits)</b>
<p><b>【Course Description】</b> The collapse of the homeostatic mechanism is thought to lead to aging and tumorigenesis. However, naked mole-rat (NMR) shows negligible senescence and significant cancer resistance. This course aims to understand the latest knowledge of the mechanisms of homeostasis maintenance in NMR, human, and mouse at the cellular and individual level. Students learn and discuss research content by participating seminars held in our laboratory and academic meetings, and by reading related research papers. In addition, students learn the fundamental skills and the principles necessary for research on aging and longevity research.</p>	
<p><b>【Evaluation for Grades and Credits】</b> We comprehensively evaluate based on: 1) the ability to understand and discuss on papers related to the research topic, 2) oral presentations, and 3) reports on experimental designs. Instead of 3), you can alternatively either write your own original paper, participate in a conference presentation, or a progress report in lab meeting.</p>	
<p><b>【Evaluation Criteria】</b>          We will evaluate the presentation and the report focusing on the followings.          1) Acquisition of the ability to understand the latest research results of aging and longevity studies          2) Understanding the principles of general analysis in cell biology / molecular biology researches and interpretation of results.          3) Understanding what methods can be used to clarify the unsolved problems of aging and longevity studies          4) Understanding of important past findings related to the aging and longevity studies</p>	

<b>A7 Study in Medical Sciences: Aging and Longevity Research</b> Supervisor: Kyoko Miura Program schedule: Site and Facilities: held mostly in the Laboratory of Aging and Longevity Research.	<b>Subject Code 10070 (Required: 8 credits)</b>
<p><b>【Course Description】</b> Students will acquire animal experiment techniques for animals such as NMR and mouse, and the methods of cell biology / molecular biology necessary for solving research subjects. Using these techniques, students will conduct basic research on elucidation of the mechanisms of the aging- and cancer-resistance phenotypes of NMR. Students will write on the above research results, and will be supported to perform their own oral presentation.</p>	
<p><b>【Evaluation for Grades and Credits】</b> We comprehensively evaluate on 1) acquisition of the experimental techniques related to the research, 2) interpretation of experimental results, and 3) oral presentation and reports on the results. Instead of 3), you can alternatively either write your own original paper, or participate in a conference presentation or a progress report in lab meeting.</p>	
<p><b>【Evaluation Criteria】</b>          We will evaluate the presentation and the report focusing on the followings.          1) Acquisition of the experimental techniques of cell biology / molecular biology necessary for elucidating the cellular-level phenotypes, and research accomplishments using the techniques          2) Acquisition of the experimental techniques of physiology / histochemistry necessary for elucidating the individual-level phenotypes, and research accomplishments using the techniques          3) Planning and accomplishment of appropriate experimental procedures for the research subject</p>	

**A6 Exercises in Medical Sciences:  
Public Health**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Takahiko Katoh, Changnian Wei, Shota Masuda, Lu Xi  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Public Health

**【Course Description】** Along with the 21st century's common keywords of Ageing Society, Information Society and Globalization, there is also a new international trend of health enhancement and disease prevention, based on the principles of health promotion and technology. In reply to these contemporary issues, this Department Course will give lectures in Health Information Medicine (epidemiology and biostatistics), International Health Medicine, and Health Care Science (Health, Medicine & Welfare system). At the same time, through practical research, students will use the social applications of medical science to understand the concepts in the relationship between medicine and society, the skills of observation and practical medical techniques. Students will be trained in how to write theses and give oral presentations based on the results of the above-mentioned research.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for public health, and ability for research planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Fundamental understanding of how to read a scientific paper, the methodology of epidemiology, and molecular biology.
- 2) Acquire the latest knowledge and understand the current conditions of lifestyle-related diseases through reviews of the literature of epidemiology research.
- 3) Acquire the latest knowledge about the molecular and environmental epidemiology and obtain new results of research in these fields.
- 4) Acquire established knowledge related to a research theme through a review of the literature, then propose and carry out an appropriate research project.

**A7 Study in Medical Sciences:  
Public health**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Takahiko Katoh, Changnian Wei, Shota Masuda, Lu Xi  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at Department of Public Health

**【Course Description】** The contents of this class are as follows: 1) acquisition of the concepts of health, medical care, and the welfare service and system; and 2) understanding molecular epidemiological studies of the interaction between genes and the environment in life-style related disease such as cancer and hypertension, and health disorders like osteoporosis. Concretely, this class provides opportunities for collecting questionnaires & genome DNA in the community and occupational field and then performing epidemiological studies, learning how to prevent illnesses, and making policies for health maintenance & promotion.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of an appropriate research design for the solution of a research theme.
- 2) Acquisition of basic experimental skills.
- 3) Revision of working hypothesis depending on the research results and examination of an appropriate research design.
- 4) Acquisition of presentation skills to announce the result of research.
- 5) Consideration of research findings and the writing of a research paper.

**A6 Exercises in Medical Sciences:  
Forensic Medicine**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Yoko Nishitani, Ako Sasao, Hiroshi Tsutsumi,, Shota Furukawa

Program Schedule: year 1-2, every Wednesday (1st period)

Site and Facilities: seminar room, laboratory room, and autopsy room at Department of Forensic Medicine

**【Course Description】** The aim of this course is to learn the skill of forensic pathology and how to diagnose causes of death. Students are also expected to study about the toxicology and biological effects of drugs and alcohol as below: (1) mechanisms of alcoholic liver disease, (2) effect of alcohol on nervous system in Drosophila, (3) analysis of affinity between drugs and proteins, (4) development of new immunological drug screening. Students are expected to submit the paper to research meetings and journals.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their understanding and knowledge earned about information on recent progress in the research for forensic pathology. The presentation at the academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding the role of forensic medicine as social medicine.
- 2) Understanding the unusual death and its treatment.
- 3) Knowledge about recent problems and arguments in the field.
- 4) Ability to summarize the background of the research and plan adequate research schedule.
- 5) Ability to summarize and present their own research results or arguments.

**A7 Study in Medical Sciences:  
Forensic Medicine**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Yoko Nishitani, Ako Sasao, Hiroshi Tsutsumi, Shota Furukawa

Program Schedule: year 1-2, every Tuesday (2nd periods)

Site and Facilities: seminar room, laboratory room, and autopsy room at Department of Forensic Medicine

**【Course Description】** The aim of this course is to discuss each case of forensic autopsies. Participating students are expected to present research results at the academic meetings and write and publish papers in international journals in the relevant fields.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their understanding and knowledge earned about information on recent progress in the research for forensic pathology. The presentation at the academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding of the forensic pathology and toxicology.
- 2) Knowledge about recent problems and arguments in the field.
- 3) Ability to summarize the background of the research and plan adequate research schedule.
- 4) Ability to summarize and present their own research results or arguments.



**A6 Exercises in Medical Sciences:  
Bioethics**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Yasuhiro Kadooka  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room at Department of Bioethics

**【Course Description】** Research methods in the field of bioethics include (1) theoretical consideration regarding ethics, political philosophy, law, cultural anthropology and (2) empirical investigation using qualitative or quantitative methods. In the subject, participating students read relevant articles and analyze various bioethical issues, and are expected to learn how to conduct their own research in the field by integrating two fore-mentioned methods. Students are required to find and determine their research themes, conduct bioethical studies, and write and publish their own academic paper in international journals in the field of bioethics, applied ethics or philosophy.

**【Evaluation for Grades and Credits】** Students are comprehensively evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about information on recent topics in bioethics, ability of planning their own research projects and interpretation and criticism of the obtained results, and capacity to develop valid arguments in bioethical deliberation.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria

- 1) Understanding of major discussions published in relevant international journals
- 2) Knowledge about recent problems and arguments in the field
- 3) Adequate understanding of the implications and significance of the results of their own research
- 4) Ability to discuss, present, and write bioethics issues in English
- 5) Ability to summarize and present their own research results or arguments.

**A7 Study in Medical Sciences:  
Bioethics**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Yasuhiro Kadooka  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room at Department of Bioethics

**【Course Description】** The aim of this course is to learn how to investigate descriptive empirical research regarding bioethical problems. Participating students are expected to present research results at the academic meetings and write and publish papers in international journals in the relevant fields.

**【Evaluation for Grades and Credits】** Students are comprehensively evaluated for their course grades and credits based on the course hours completed, understanding and knowledge earned about information on recent progress in the research for bioethics, ability for planning their own research projects and interpretation and criticism of the obtained results, and capacity to develop valid arguments in bioethical deliberation.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria

- 1) Ability to conduct appropriate literature review and identify unresolved bioethical issues and determine their own research themes.
- 2) Ability to plan research projects
- 3) Ability to conduct their research projects in an appropriate manner
- 4) Ability to consider the implications of research results or their own arguments, summarize and present their own research results or arguments at the academic meetings, and write and publish articles

<b>A6 Exercises in Medical Sciences: Respiratory Medicine</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisor: Takuro Sakagami, Hidenori Ichiyasu, Shinichiro Okamoto, Yusuke Tomita, Koichi Saruwatari, Shinji Iyama, Shinya Sakata, Aiko Masunaga, Chieko Yoshida, Syohei Hamada, Kimitaka Akaike Program Schedule: year 1-2, every Monday (3rd period) Site and Facilities: seminar room and laboratories at Department of Respiratory Medicine, and Souken	
<p><b>【Course Description】</b> The aim of this Departmental Course is to learn how to summarize clinical and experimental data for clinical implication by investigating airway and pulmonary inflammation with immunological, allergological, microbiological approach. Additionally, pathogenesis of lung cancer is investigated by genetic analysis. To learn cell biology on respiratory cells obtained by bronchoalveolar lavage and lung biopsy, high quality of papers on respiratory medicine are choose to discuss the scientific and medical values of the research. On the bases of above-mentioned processes, clinically obtained specimens and experimental models of lung diseases are investigated. Finally, the experimental results should be reported at the international conferences and published on international scientific journals in the fields of respiratory medicine and its related fields. All instructions of these processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for respiratory medicine including allergy, infection, interstitial lung disease and lung cancer, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Histochemical staining and its diagnosis are understood, and relating novel findings are obtained</li> <li>2) Immunohistochemical staining and its diagnosis are understood, and relating novel findings are obtained.</li> <li>3) Experimental model analysis and genetic analysis are understood, and relating novel findings are obtained</li> <li>4) Proposal of appropriate research projects on the basis of understanding the background of the respiratory diseases, and the projects should be described and the experiment should be done.</li> </ol>	

<b>A7 Study in Medical Sciences: Respiratory Medicine</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisor: Takuro Sakagami, Hidenori Ichiyasu, Shinichiro Okamoto, Yusuke Tomita, Koichi Saruwatari, Shinji Iyama, Shinya Sakata, Aiko Masunaga, Chieko Yoshida, Syohei Hamada, Kimitaka Akaike Program Schedule: year 1-2, every Wednesday (3rd periods) Site and Facilities: seminar room and laboratories at Department of Respiratory Medicine, and Souken	
<p><b>【Course Description】</b> The aim of this class is to acquire the techniques to analyze clinical and experimental data for clinical implication by investigating airway and pulmonary inflammation with immunological, allergological, microbiological approach. Additionally, pathogenesis of lung cancer is investigated by genetic analysis. Respiratory infectious disease and acute respiratory distress syndrome (ARDS) are investigated by using clinical protocol for finding their diagnosis and therapy. In interstitial lung disease, lung remodeling mechanism probably induced by cytokines is investigated by molecular biological approach on lung cells and inflammatory cells. The results should be reported at the international conferences and published on international scientific journals in the fields of respiratory medicine and its related fields.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills of histochemical staining and its diagnosis.</li> <li>2) Acquisition of experimental skills of immunohistochemical staining and its diagnosis.</li> <li>3) Acquisition of experimental model analysis and genetic analysis</li> <li>4) Planning the experiment of research projects and analyze the obtained data for further research.</li> <li>5) Analysis of the results and reporting at international conferences and scientific journals.</li> </ol>	

**A6 Exercises in Medical Sciences:  
Cardiology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kenichi Tsujita  
Program Schedule: year 1-2, every Tuesday (2nd period)  
Site and Facilities: seminar room and laboratories at Department of Cardiovascular Medicine

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of pathogenesis of cardiovascular diseases. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for prevention and treatment of cardiovascular diseases. Specific research projects to be executed should be determined by searching latest literatures related to the cardiovascular diseases. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of cardiovascular medicine. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course. The content of this Course is the followings: 1) To learn the coagulation and fibrinolytic biomarkers that are related to the pathogenesis of acute coronary syndrome, and discuss the merits and demerits of the clinical assessment in the platelet activation; 2) To learn the clinical evidences for Japanese population based on prospective studies linking with clinical practice; 3) To learn the theories and methods of the gene analysis by using the DNA microarray; 4) To establish the mouse models of experimental myocardial infarction or ischemia / reperfusion, analyze the molecules related to cardiac remodeling and myocardial ischemia / reperfusion injury; 5) To learn the mechanism in the expression of atherogenic molecules in cultured vascular endothelial cells and vascular smooth muscle cells; 6) To explore the stimulating factors which cause the myocardial hypertrophy by using the rat neonatal myocardium. 7) To learn the theories and methods to generate genetically altered mice. 8) To learn how to evaluate physiological parameters in small animal by using echocardiography and micro catheter.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research, and the ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Proposal of appropriate research projects on the basis of understanding the background on the pathogenesis of cardiovascular diseases.  
2) Understanding how to perform the experiments related to the basic and clinical cardiovascular researches described in the Course Description.  
3) Appropriate experimental design to identify the important factors for the pathogenesis of cardiovascular diseases.  
4) Novel findings obtained by appropriate and proper analytical approaches.  
5) Original and innovative findings that can contribute to better understanding for cardiovascular pathogenesis.  
6) Acquisition of knowledge and skills to generate genetically altered mice and to evaluate their phenotypes.

**A7 Study in Medical Sciences:  
Cardiology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kenichi Tsujita  
Program Schedule: year 1-2, every Thursday (2nd periods)  
Site and Facilities: seminar room and laboratories at Department of Cardiovascular Medicine

**【Course Description】** The aim of this class is to acquire the techniques to analyze the pathogenesis and mechanism of cardiovascular diseases. Specifically, experimental techniques to be earned in this course include ELISA to measure the biomarkers of blood coagulation and fibrinolysis in ischemic heart diseases. The experimental techniques also include the measurements of platelet aggregation by using the optical density change or light scattering. You learn how to isolate and culture vascular endothelial and smooth muscle cells, and neonatal rat cardiomyocytes. Difference of rat myocyte hypertrophy induced by various stimulators is observed in light microscopy. Protein or mRNA extraction, Western blot, and real-time RT-PCR analysis by using the samples of cardiovascular tissues and cultured cells are also studied in this Departmental Course. You learn the theories and methods how to generate genetically altered mice. Their phenotypes are analyzed by various modalities including echocardiography and micro catheter.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Acquisition and understanding of skills to perform ELISA for the measurement of the biomarkers of blood coagulation and fibrinolysis in ischemic heart diseases.  
2) Understanding how to measure platelet aggregation by using the optical density change or light scattering.  
3) Acquisition of experimental techniques to isolate and culture vascular endothelial and smooth muscle cells, and neonatal rat cardiomyocytes.  
4) Acquisition of experimental skills to observe phenotype difference of rat myocyte hypertrophy induced by various stimulators by using light microscopy.  
5) Understanding of protein or mRNA extraction, Western blot, and real-time RT-PCR analysis from the samples of cardiovascular tissues and cultured cells.  
6) Acquisition of knowledge and skills to generate genetically altered mice and to evaluate their phenotypes.

<p><b>A6 Exercises in Medical Sciences: Endocrinology and Metabolism</b></p> <p>Supervisor: Eiichi Araki  Program Schedule: year 1-2, every Tuesday (2<sup>nd</sup> period)  Site and Facilities: seminar room and laboratories at Department of Metabolic Medicine</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b>Select several manuscripts concerning the mechanisms of the hormonal action and the cause of metabolic or endocrinological diseases, and learn the molecular biological methods that are used for analysis. Moreover, how these techniques are applied to reveal underlying mechanism and to create the novel treatment of the metabolic or endocrinological diseases will be maneuvered by the rap session. Furthermore, after the intensive analysis at the levels of gene, protein, organs and individuals on the mechanisms of the metabolic or endocrinological diseases, make discussion concerning the meaning and application to diagnosis and to treatment of the obtained results. Finally, learn how to present the results and make manuscripts.</p>	
<p><b>【Evaluation for Grades and Credits】</b>It depends on reports. The presentation technique including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Understanding the emergence mechanism of hormone action as well as metabolic and endocrinological diseases.</li> <li>2) Understanding the emergence mechanism of arteriosclerosis, dyslipidemia and diabetic complications.</li> <li>3) Understanding the molecular biological methods to analyze the diseases.</li> <li>4) Ability to apply the molecular biological methods to analyze the disease.</li> <li>5) Ability to analyze the mechanism of the metabolic and endocrinological diseases, with regard to the levels of gene, protein, organs and individuals.</li> <li>6) Understanding the meaning of the results and ability to apply the results to diagnosis and treatment of the diseases</li> <li>7) Ability to summarize the results to the manuscript.</li> </ol>	

<p><b>A7 Study in Medical Sciences: Endocrinology and Metabolism</b></p> <p>Supervisor: Eiichi Araki  Program Schedule: year 1-2, every Thursday (2<sup>nd</sup> period)  Site and Facilities: seminar room and laboratories at Department of Metabolic Medicine</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this class is to acquire the methods, such as Western blotting, ELISA, flow-cytometry, RT-PCR and immunohistochemical analysis (<i>in vivo</i>, <i>in vitro</i>, <i>ex vivo</i>), to analyze the function of the molecules which involve in the metabolic and endocrinological disorders by using cultured cells and model animals. Practice about the methods for preparing the (conditional) genetically engineered animals, whose gene is related to the metabolic and endocrinological diseases, and the methods to analyze the glucose and lipid metabolism, such as glucose tolerance test, insulin tolerance test and glucose-clamp technique.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills to perform techniques concerning molecular cell biology and immunohistochemistry, such as Western blotting, ELISA, flow-cytometry, RT-PCR and immunostaining methods.</li> <li>2) Acquisition of experimental skills to prepare the (conditional) genetically engineered animals.</li> <li>3) Acquisition of experimental skills to analyze the glucose and lipid metabolism by using glucose tolerance test, insulin tolerance test, glucose-clamp technique and so on.</li> </ol>	

**A6 Exercises in Medical Sciences:  
Nephrology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Masashi Mukoyama  
Program Schedule: year 1-2, every Thursday (2nd period)  
Site and Facilities: to be announced

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the elucidation of the molecular pathophysiology of the kidney diseases. Then, students should learn the methods of the molecular biology, cell biology, protein chemistry, and molecular genetics to design the experimental strategy to prove the hypothesis. The nephron is composed of a variety of differentiated cells and the function of each nephron segment is completely different from the others. Students should learn the heterogeneity of each nephron segment function and the diversity of the kidney disease phenotypes that are caused by the disorder of a single nephron segment. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for renal physiology and kidney diseases, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Students should complete more than 75% of the total course hours.
- 2) Understanding the functional heterogeneity of the nephron segment.
- 3) Understanding the distribution of the ion channels, ion transporters, and hormone receptors along the nephron segment.
- 4) Understanding the pathophysiology of the kidney diseases related to the functional disorders of the ion channels/transporters and the hormone receptors.

**A7 Study in Medical Sciences:  
Nephrology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Masashi Mukoyama  
Program Schedule: year 1-2, every Tuesday (2nd periods)  
Site and Facilities: to be announced

**【Course Description】** The aim of this class is to acquire the techniques to analyze the expression levels of specific genes and proteins from the isolated kidneys from rats and mice as well as from the cultured mammalian cells. Specifically, students are required to learn the regulatory mechanisms of gene expression by measuring the expression levels of ion channels/transporters in the animal disease models. Also, students are required to learn the molecular pathophysiology of the "ion channelopathies" by investigating the structure-function relationships of the ion channels/transporters. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for renal physiology and kidney diseases, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Students should complete more than 75% of the total course hours.
- 2) Understanding the techniques to isolate and analyze the expression levels of mRNA and the DNA sequences.
- 3) Understanding the techniques to isolate and analyze the expression levels of proteins and their function.
- 4) Understanding the techniques to culture mammalian cells.

**A6 Exercises in Medical Sciences:  
Gastroenterology and Hepatology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Yasuhito Tanaka, Hideaki Naoe, Masakuni Tateyama, Hiroko Setoyama, Katsuya Nagaoka, Takehisa Watanabe, Shumpei Hashigo, Yoko Yoshimaru, Ryosuke Gushima, Hideaki Miyamoto, Youki Furuta

Program Schedule: year 1-2, every Friday (1st period)

Site and Facilities: Seminar room and laboratory at Department of Gastroenterology & Hepatology

**【Course Description】**

Recent progress in medicine has identified molecular mechanisms underlying gastrointestinal & liver diseases, leading to the development and application of new therapies. Aim of this course is 1) to learn molecular mechanisms underlying inflammation and carcinogenesis in the gastrointestinal tract as well as liver, 2) to comprehend how molecular mechanisms would be modulated and regulated for the purpose of treatment on gastrointestinal and liver diseases. In particular, learn about the latest molecular-targeted therapies and immunotherapies including immune check inhibitors.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned in the course, the report regarding contents in the course.

**【Evaluation Criteria】**

The students, who have completed more than 75% of the whole course, would be required to submit a report regarding the course lectures. The report will be evaluated regarding the criteria listed below.

- 1) Comprehension on variety of gastrointestinal and liver cancers and their incidence rates.
- 2) Comprehension on precancerous lesions of gastrointestinal and liver cancers
- 3) Comprehension on the relation between inflammation and carcinogenesis

**A7 Study in Medical Sciences:  
Gastroenterology and Hepatology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Yasuhito Tanaka, Hideaki Naoe, Masakuni Tateyama, Hiroko Setoyama, Katsuya Nagaoka, Takehisa Watanabe, Shumpei Hashigo, Yoko Yoshimaru, Ryosuke Gushima, Hideaki Miyamoto, Youki Furuta

Program Schedule: year 1-2, every Monday (3rd period)

Site and Facilities: Seminar room and laboratory at Department of Gastroenterology & Hepatology

**【Course Description】**

To approach the experimental theme which has been set during exercise in medical sciences, learn how to analyze viral mutations, human gene expression and cytokines/chemokines expression involved in pathogenesis of gastro-intestinal and liver diseases. In this regard, students will have experiences with animal models or human samples to determine hepatitis virus mutations, human gene abnormality including LOH and point mutation, gene expression by PCR, protein expression by Western blotting and immune-histochemistry. In addition, students will learn how to conduct genome-wide analysis (SNP, miRNA, etc.) and serum contents of cytokines or chemokines using human specimens.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the oral presentation and reports regarding how they could obtain experimental procedures and how they understand and evaluate experimental results.

**【Evaluation Criteria】**

The oral presentation and reports will be evaluated regarding the criteria listed below.

- 1) Whether the student could understand hepatitis virus mutations, gene abnormality and changes in serum cytokine and chemokine contents involved in gastrointestinal and liver diseases?
- 2) Whether the student could comprehend scientific principles of PCR, Western blotting, immune-histochemistry?
- 3) Whether the student could understand involvement of viral mutations and gene abnormality?
- 4) Whether the student could obtain experimental procedures and draw up research protocols regarding the experimental theme?

<b>A6 Exercises in Medical Sciences:</b> <b>Department of Hematology, Rheumatology and Infectious Disease</b>	<b>Subject Code 10060</b> <b>(Required: 8 credits)</b>
Supervisors: Masao Matsuoka, Kisato Nosaka, Jun-ichirou Yasunaga, Shinya Hirata Program schedule: year 1-2, every Tuesday (2nd period) Site and Facilities: seminar room and laboratories at Department of Hematology	
<b>【Course Description】</b> The aim of this course is to advance the understanding of the mechanisms of the immune system, important pathophysiology and treatment methods in the field of hematology, collagen disease and infectious diseases for solving unsolved problems, and to deepen the understanding of cell biological, immunological, biochemical or molecular biological methods. Obtained experimental results are to be reported at the international conferences and published in international scientific journals.	
<b>【Evaluation for Grades and Credits】</b> Students are evaluated for attendance to seminars, the understanding and ability of scientific and practical criticism on the relevant issues. In addition, the attendees' ability of experimental planning, interpretation and criticism of the results are promoted. Publication and presentations including discussions in the laboratory and academic meetings are also taken into consideration for assessment.	
<b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria. 1) Acquisition of understanding the research results described in English in hematology, collagen disease and infectious disease. 2) Acquisition of understanding the principles of general analysis methods and the interpretation of the results. 3) Acquisition of the understanding the past important discoveries related to the research subject. 4) Obtainment of new research results in hematology, collagen disease and infectious disease.	

<b>A7 Study in Medical Sciences:</b> <b>Department of Hematology, Rheumatology and Infectious Disease</b>	<b>Subject Code 10070</b> <b>(Required: 8 credits)</b>
Supervisor: Masao Matsuoka, Kisato Nosaka, Jun-ichirou Yasunaga, Shinya Hirata Program Schedule: year 1-2, every Thursday (2nd period) Site and Facilities: seminar room and laboratories at Department of Hematology	
<b>【Course Description】</b> The aim of this course is to advance the understanding of the mechanisms of the immune system, important pathophysiology and treatment methods in the field of hematology, collagen disease and infectious diseases for solving unsolved problems, and to deepen the understanding of cell biological, immunological, biochemical or molecular biological methods. Obtained experimental results are to be reported at the international conferences and published in international scientific journals.	
<b>【Evaluation for Grades and Credits】</b> Students are evaluated for attendance to seminars, the understanding and ability of scientific and practical criticism on the relevant issues. In addition, the attendees' ability of experimental planning, interpretation and criticism of the results are promoted. Publication and presentations including discussions in the laboratory and academic meetings are also taken into consideration for assessment.	
<b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria. 1) Acquisition of understanding the research results described in English in hematology, collagen disease and infectious disease. 2) Acquisition of understanding the principles of general analysis methods and the interpretation of the results. 3) Acquisition of the understanding the past important discoveries related to the research subject. 4) Obtainment of new research results in hematology, collagen disease and infectious disease.	

<b>A6 Exercises in Medical Sciences:</b>	<b>Subject Code 10060</b>
<b>Neurology</b>	<b>(Required: 8 credits)</b>
<p>Supervisor: Mitsuharu Ueda  Program Schedule: year 1-2, every Thursday(1st period)  Site and Facilities: seminar room and laboratories at Department of Neurology</p>	
<p><b>【Course Description】</b> The aim of this Departmental Coarse is to learn the achievement of modern neurology regarding etiology, and pathologic elucidation of hereditary neurodegenerative diseases. Students are required to practice on several disease models and evaluate likelihood of clinical application and future prospects of gene therapy as well as regenerative therapy on such diseases. All research results mentioned above are summarized in a thesis, and a guidance will be provided to give an oral presentation.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the coarse hours completed, their understanding and knowledge earned about scientific information on recent progress in the field of their research, and ability for experimental planning and interpretation and criticism on the results obtained. The presentation including discussion at the laboratory and academic meetings and scientific papers cited in international peer-reviewed journal, are also taken into consideration to assess the level of achievements in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Novel research results are always updated and latest knowledge in neurology are obtained.</li> <li>2) Obtaining knowledge about gene therapy, basic research on regenerative therapy and their clinical application.</li> <li>3) Proposal of appropriate research projects and performing original and innovative experimental studies on the bases of conventional knowledge associated with their study theme.</li> </ol>	

<b>A7 Study in Medical Sciences:</b>	<b>Subject Code 10070</b>
<b>Neurology</b>	<b>(Required: 8 credits)</b>
<p>Supervisor: Mitsuharu Ueda  Program Schedule: year 1-2, every Monday (1st periods)  Site and Fascilities: seminar room and laboratories at Department of Neurology</p>	
<p><b>【Course Description】</b>The aim of this class is to acquire the basic techniques required to develop the gene therapy, regenerative therapy for laboratory mice as well as human subjects, such as cell culture, immuno-histochemistry, Western blotting, and molecular biologic experimental maneuvers. Depending on need for their own projects, training about observation of immunostaining specimens, electron microscope, and cell culture will be trained.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their coarse grades and credits based on the coarse hours completed, their experimental skills and techniques acquired during this coarse, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student’s presentation and discussion or progress reports at the laboratory meeting, presentation in academic meetings or peer-reviewed papers cited on academic journals.</p>	
<p><b>【Evaluation Criteria】</b> The achievement on each student’s research thesis will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills for cell culturing, immuno-histostaining, and Western blotting.</li> <li>2) Acquisition of maneuver to transfer therapeutic gene into viral vector.</li> <li>3) Acquisition of basic experimental techniques used in the field of gene therapy required in animal models.</li> <li>4) Logical/proper experimental study protocol being planned and carried out continuously.</li> </ol>	



**A6 Exercises in Medical Sciences:  
Pediatrics**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kimitoshi Nakamura  
Program Schedule: year 1-2, every Friday (2nd period)  
Site and Facilities: to be announced

**【Course Description】**

Offers a broad range of studies related to genes and human disorders, gene therapy, early diagnosis. Provides a detailed analysis of molecular approaches used to characterize the various human disorders and gene therapy for the genetic disorders, which has been recently applied to cure the genetic disorders of children.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the mini-report about understanding of contents provided in each study theme, or publication, presentation above mentioned tasked at the end of each class.

**【Evaluation Criteria】**

Understanding the basic mechanism of Genetic disorders  
Understanding the early diagnosis  
Understanding of the clinical uses of gene therapy  
Understanding the ethics

**A7 Study in Medical Sciences:  
Pediatrics**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kimitoshi Nakamura  
Program Schedule: year 1-2, every Tuesday (2nd period)  
Site and Facilities: to be announced

**【Course Description】**

Provides a detailed analysis of human genetic disorders, molecular approaches used to characterize the primary gene defects, and gene therapy, early diagnosis for various heritable human disorders with emphasis on the most recent developments.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the mini-report about understanding of contents provided in each study theme above mentioned tasked at the end of each class.

**【Evaluation Criteria】**

Understanding the basic mechanism of Genetic disorders  
Understanding the early diagnosis  
Understanding of the clinical uses of gene therapy  
Understanding the ethics

**A6 Exercises in Medical Sciences:****Subject Code 10060****Diagnostic Medicine****(Required: 8 credits)**

Instructor: Hirotaka Matsui

Program Schedule: year 1-2, every Wednesday (1st period)

Site and Facilities: seminar room and laboratories at the Department of Molecular Laboratory Medicine

**【Course Description】** Recent advance in comprehensive genome analysis led to the identification of many somatic as well as germ-line gene variants that are involved in the development of malignancies. Therefore, it is expected that malignancies will be diagnosed at a high sensitivity in the department of laboratory medicine within near future. Meanwhile, students who wish to get involved in laboratory medicine are expected to understand molecular pathogenesis of malignancies. Based on these backgrounds, the experiments in this course include gene mutation searching, cDNA cloning and functional analysis of mutant proteins. The education is aimed at the development of students' faculties to plan and execute experiments that will be necessary to settle unresolved issues by the students themselves. In addition, newly introduced analytical techniques in the field of laboratory medicine will be introduced to the students.

**【Evaluation for Grades and Credits】** Students will be evaluated based on their ability to understand and criticize scientific reports and literatures, to make plan for their own researches, and to interpret and present their experimental results by oral presentations and reports. The reports can be substituted by publication of scientific papers, presentations in scientific meetings, or progress reports in laboratory meetings.

**【Evaluation Criteria】** Evaluations are based on the following criteria for the research theme of each student.

- 1) Ability to collect and understand the manuscripts (written in English) that are helpful to their own research projects.
- 2) Understanding the principles of general analytical methods in molecular biology as well as in biochemistry.
- 3) Acquisition of skills to perform experiments by themselves and ability to interpret the results of the experiments appropriately.
- 4) Comprehension of analytical methods that can be utilized for the resolution of uncertain issues in the research field of oncology.
- 5) Ability to perform presentations of their own research.
- 6) Understanding the previous innovative findings in the research area of laboratory medicine.

**A7 Study in Medical Sciences:****Subject Code 10070****Diagnostic Medicine****(Required: 8 credits)**

Instructors: Hirotaka Matsui

Program Schedule: year 1-2, every Wednesday (2nd period)

Site and Facilities: seminar room and laboratories at the Department of Molecular Laboratory Medicine

**【Course Description】**

In this course, the students will receive instructions for the achievement of experimental techniques in laboratory medicine using human and mice materials, which are required to figure out the given research subjects. In addition, the students will be educated with recent advances in laboratory medicine, especially in hematological malignancies including leukemia and myelodysplastic syndrome. Furthermore, the class in this course provides information about the development of diagnostic techniques in laboratory medicine, which is intended to give suggestions to the students' own interests.

**【Evaluation for Grades and Credits】** Students are evaluated based on the acquisition of experimental skills and reports. The reports can be substituted by publication of scientific papers, presentations in scientific meetings, or progress reports in laboratory meetings.

**【Evaluation Criteria】**

Evaluations will be based on the following criteria for the research theme of each student.

- 1) Acquisition of techniques for the analysis of molecular pathogenesis.
- 2) Acquisition of experimental techniques in laboratory medicine.
- 3) Research progression by obtaining basic and translational experimental data which might give rise to the development of new diagnostic systems.
- 4) Adequate planning and execution of experiments for conducting their research.

**A6 Exercises in Medical Sciences:  
Diagnostic Radiology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Toshinori Hirai  
Program Schedule: year 1-2, every Thursday (2nd period)  
Site and Facilities: Diagnostic Radiology Conference Room 13F

**【Course Description】** The aim of this Departmental Course is to learn how imaging technology development has been applied to diagnosis various diseases and how it has contributed to the improvement of treatment outcome. Practical knowledge of diagnostic radiology, including the role of MR,CT, nuclear medicine, ultrasound and interventional radiology will be discussed. In addition, radiological anatomy of various organs will be studied. The clinical results should be presented in the conference.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for diagnostic radiology, and ability for experimental and clinical study planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding and knowledge of the principle and method of diagnostic radiology and radiological anatomy.
- 2) Proposal and execution of appropriate research projects in imaging studies
- 3) Proposal and execution of appropriate research projects in other imaging techniques.

**A7 Study in Medical Sciences:  
Diagnostic Radiology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Toshinori Hirai  
Program Schedule: year 1-2, every Tuesday (2nd periods)  
Site and Facilities: Diagnostic Radiology Conference Room 13F

**【Course Description】** The aim of this Departmental Course is to learn how various imaging modalities including MR,CT, nuclear medicine, ultrasound and interventional radiology has been applied to diagnosis various diseases of various organs including brain, head&neck, chest, abdomen, pelvis and musculoskeletal systems. Practical knowledge of diagnostic radiology and imaging findings will be discussed. In addition, the principle and method of 3-D rendering technique and image processing will be also discussed using dedicated workstation. The experimental or clinical results should be reported in international scientific journals in the fields of diagnostic radiology.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, the degree of understanding of diagnostic radiology acquired during the course and reports submitted for evaluation.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding and knowledge of the principle and method of diagnostic radiology and 3-D imaging.
- 2) Proposal and execution of appropriate research projects in 3-D imaging.
- 3) Proposal and execution of appropriate research projects in other imaging techniques.

**A6 Exercises in Medical Sciences:  
Radiation Oncology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Natsuo Oya  
Program Schedule: year 1-2, every Tuesday (2nd period)  
Site and Facilities: Radiotherapy Planning Room , New Clinical Laboratory and Examination Center BF

**【Course Description】** The aim of this Departmental Course is to learn how biological and technological development has been applied to cancer radiotherapy and how it has contributed to the improvement of cancer treatment outcome. By patients undergoing radiotherapy, practical knowledge of radiation oncology and radiotherapy, including the role of radiotherapy in cancer treatment, the procedure of eligibility decision, the technique of radiotherapy field setting and dose fractionation planning, the technique of irradiation, will be discussed. In addition, the principle and method of high-precision 3-D conformal external beam radiotherapy, including stereotactic radiotherapy, intensity modulated radiotherapy and functional image-incorporating radiotherapy, will be also discussed by participating in treatment planning or phantom experiments. The experimental or clinical results should be reported in international scientific journals in the fields of radiation oncology.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for radiation oncology, and ability for experimental and clinical study planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding and knowledge of the principle and method of radiation oncology and high-precision 3-D conformal external beam radiotherapy.
- 2) Proposal and execution of appropriate research projects in high-precision 3-D conformal external beam radiotherapy.
- 3) Proposal and execution of appropriate research projects in other radiotherapy techniques.

**A7 Study in Medical Sciences:  
Radiation Oncology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Natsuo Oya  
Program Schedule: year 1-2, every Thursday (2nd periods)  
Site and Facilities: Radiotherapy Planning Room , New Clinical Laboratory and Examination Center BF

**【Course Description】** By patients undergoing radiotherapy, practical knowledge of radiation oncology and radiotherapy, including the role of radiotherapy in cancer treatment, the procedure of eligibility decision, the technique of radiotherapy field setting and dose fractionation planning, the technique of irradiation, will be discussed. Students are encouraged to learn how to operate the radiotherapy planning system, to designate adequate radiotherapy plans for various clinical cases, and to evaluate the plans experimentally. They are also encouraged to participate in the clinical conferences to understand the role of radiation oncology as an important part of the multi-disciplinary cancer treatment

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, the degree of understanding of radiation oncology, their radiotherapy planning techniques acquired during the course and reports submitted for evaluation.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding and knowledge of the principle and method of radiation oncology.
- 2) Understanding of the treatment procedure of radiotherapy.
- 3) Acquisition of radiotherapy planning techniques.
- 4) Proposal and execution of appropriate experimental radiotherapy planning.
- 5) Understanding of the practice of clinical radiotherapy.

**A6 Exercises in Medical Sciences:  
Neuropsychiatry**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Minoru Takebayashi  
Program Schedule: year 1-2, every Monday (3rd period)  
Site and Facilities: seminar room and laboratories at Department of Neuropsychiatry

**【Course Description】** The aim of this Departmental Course is to learn about biological pathophysiology of neuropsychiatric disorders such as mood disorders and dementia, using several latest papers for neuroscience. Another aim is to learn procedure of diagnosis and treatment for these neuropsychiatric disorders by practicing clinical cases. Further aim is to learn the concept of translational research between basic neuroscience and clinical psychiatry.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding literary works and reports earned about research theme, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of reading ability of neuroscience papers for neuropsychiatric disorders and being able to summarize and discuss exactly.
- 2) Acquisition of the latest basic biological knowledge about neuropsychiatric disorders.
- 3) Acquisition of the clinical knowledge of diagnosis and treatment for neuropsychiatric disorders
- 4) Acquisition of understanding translational aspect between basic neuroscience and clinical psychiatry through practicing clinical cases.

**A7 Study in Medical Sciences:  
Neuropsychiatry**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Minoru Takebayashi  
Program Schedule: year 1-2, every Monday (4th periods)  
Site and Facilities: seminar room and laboratories at Department of Neuropsychiatry

**【Course Description】** The aim of this class is to acquire the techniques to analyze biological pathophysiology, the ability to plan and conduct the biological study for neuropsychiatric disorders such as mood disorders and dementia.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during their course, and reports submitted for evaluation. The report assessment can be submitted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to assess psychiatric and behavioral symptoms using validated evaluation scales.
- 2) Acquisition of experimental skills to analyze neuroimaging data and biological markers.
- 3) Acquisition of experimental skills to construct a plan of study by using databases and clinical statistical skills.
- 4) Proposal of appropriate research projects to identify novel finding.

<p><b>A6 Exercises in Medical Sciences: Disaster and Critical Care Medicine</b></p> <p>Supervisors: Shunji Kasaoka  Program schedule: year 1-2  Site and Facilities: seminar room at Clinical Medicine Research Building</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b>  The aim of this Departmental Course is to exercise on clinical issues by reviewing the latest papers on emergency medicine and disaster medicine.</p>	
<p><b>【Evaluation for Grades and Credits】</b>  Comprehensive evaluation is based on understanding of papers related to research themes, and oral presentations and reports on research planning.</p>	
<p><b>【Evaluation Criteria】</b>  Evaluation by the report is to acquire basic knowledge about emergency medicine and disaster medicine, understand clinical problems, and formulate research plans.</p>	

<p><b>A7 Study in Medical Sciences: Disaster and Critical Care Medicine</b></p> <p>Supervisors: Shunji Kasaoka  Program schedule: year 1-2  Site and Facilities: seminar room at Clinical Medicine Research Building</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b>  The purpose of this Departmental Course is to guide clinical research to solve problems related to emergency medicine and disaster medicine. Guidance will be given to summarize research results in a paper and give oral presentations.</p>	
<p><b>【Evaluation for Grades and Credits】</b>  Comprehensive evaluation will be conducted by oral presentations and reports on the results related to the research theme.</p>	
<p><b>【Evaluation Criteria】</b>  The evaluation based on the report will be conducted on the acquisition of basic knowledge on emergency medicine and disaster medicine, and the formulation and execution of research plans.</p>	

<b>A6 Exercises in Medical Sciences: General Medicine and Clinical Epidemiology</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisors: Kunihiko Matsui, MD, MPH Program schedule: year 1-2 Site and Facilities: General Medicine at 4 <sup>th</sup> floor of Outpatient Building	
<b>【Course Description】</b> To conduct a clinical research project, we will discuss for the basic knowledge for clinical study, such as types of study designs, outcome settings, data analysis, result interpretation in addition to the limitation of the results.	
<b>【Evaluation for Grades and Credits】</b> Small Quizzes in the classroom. If not, report submission would be expected with an assigned topic.	
<b>【Evaluation Criteria】</b> A student who did not have achieved appropriate level of understanding the topics, it might be required to submit a report for assigned topic.	

<b>A7 Study in Medical Sciences: General Medicine and Clinical Epidemiology</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisors: Kunihiko Matsui, MD, MPH Program schedule: year 1-2 Site and Facilities: General Medicine at 4 <sup>th</sup> floor of Outpatient Building	
<b>【Course Description】</b> To conduct a clinical research project by their own interest and hypothesis, find a related paper with appropriate structured search methods, and critically assess and review the paper. Also we will discuss for the basic knowledge, such as types of study designs, outcome settings, data analysis, result interpretation in addition to the limitation of the results.	
<b>【Evaluation for Grades and Credits】</b> Report the results of the review structurally for each assessment point.	
<b>【Evaluation Criteria】</b> Following points would be necessary to write a report. 1) Searching strategy for papers, such as key words and database. 2) Study design: appropriateness and problems, outcome settings 3) Data analysis methods: appropriateness and problems 4) Results interpretation, validity, reliability, and generalizability problems 5) Other limitations	

<p><b>A6 Exercises in Medical Sciences: Health Care Science</b></p> <p>Supervisor: Hirofumi Soejima  Program Schedule: year 1-2, every Thursday (4<sup>th</sup> period)  Site and Facilities: Health Care Center at Kurokami Campus</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> It is well-known that lifestyle-related disease is caused by the changes of life environment factors such as aging, food, exercise, sleep, and stress. In this departmental course, students learn how the life environment factors including food, exercise, sleep, and stress is associated with lifestyle-related disease such as obesity, diabetes mellitus, hypertension, and hyperlipidemia. Then, students learn the receptivity of salt and sweetness that influence feeding, learn cardiopulmonary function or blood coagulation in case of decreased exercise function, and learn mental psychological analysis to reveal response pattern for stress to examine the fluctuation of physiology function and exercise function through life cycle.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for health care science, and ability for study planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.  1) Acquisition of the latest knowledge about lifestyle-related disease and disease in youth.  2) Proposal of appropriate research projects on the basis of understanding the background on health care science and execution of the study.</p>	
<p><b>A7 Study in Medical Sciences: Health Care Science</b></p> <p>Supervisor: Hirofumi Soejima  Program Schedule: year 1-2, every Thursday (3rd period)  Site and Facilities: Health Care Center at Kurokami Campus</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> In this departmental course, students measure the receptivity of salt and sweetness that influence feeding, measure cardiopulmonary function or blood coagulation in case of decreased exercise function, perform mental psychological analysis to reveal response pattern for stress to examine the fluctuation of physiology function and exercise function through life cycle. Specific research projects to be executed should be determined by searching latest literatures related to the health medicine. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their study skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.  1) Acquisition of the latest knowledge about life style related disease and disease in youth.  2) Logical/proper study design to prove the hypothesis about health care science .  3) Novel findings obtained by appropriate analytical approaches.</p>	



**A6 Exercises in Medical Sciences:  
Medical Information Sciences**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Taishi Nakamura  
Program Schedule: year 1-2, every Tuesday (5th period)  
Site and Facilities: professor's room or seminar room at Department of Medical Information Sciences

**【Course Description】** The aim of this Departmental Course is to learn how to use the progress of information communication technology in the medical field, develop talented medical practitioners and find the usefulness of alternative medicine. Research projects are mainly focused on learning basic technology and development of 1) an electronic medical record system that has various interfaces for entering medical records, 2) a suitable system for given disease susceptibility analysis, 3) database technology, internet technology, and eXtensible Markup Language and 4) a system that can evaluate clinical skills, effectiveness of alternative medicine and implement e-Learning system for educating medical practitioners and alternative medicine. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for medical informatics and communication technology, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the department and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Proposal of appropriate research projects on the basis of understanding the background on medical informatics  
2) Understanding how to investigate problems in the field of disease susceptibility analysis  
3) Logical/proper experimental design to identify the factors for progress in alternative medicine  
4) Novel findings obtained by appropriate and proper analytical approaches for educating medical practitioners  
5) Original and innovative findings that can contribute not only to better understanding for medical informatics but also to successful development of electronic health records system that is useful for education, research and medical practice

**A7 Study in Medical Sciences:  
Medical Information Sciences**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Taishi Nakamura  
Program Schedule: year 1-2, every Thursday (5th periods)  
Site and Facilities: professor's room or seminar room at Department of Medical Information Sciences

**【Course Description】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for medical informatics and communication technology, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the department and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the department and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Acquisition of experimental skills to produce electronic health record systems  
2) Understanding how to investigate problems in the field of disease susceptibility analysis  
3) Acquisition of experimental techniques to identify the factors for progress in alternative medicine  
4) Understanding of technique that is useful for developing databases and internet communication  
5) Acquisition of suitable technique to investigate educational system for medical practitioners, alternative medicine and medical economy

**A6 Exercises in Medical Sciences:  
Gastroenterological Surgery**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Hideo Baba et al.  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Gastroenterological Surgery

**【Course Description】** The mechanisms of the disease caused by the functional and morphologic disorder in digestive organ will be addressed in this program. Furthermore, advanced surgical care such as minimally invasive surgery for benign disease and multi-modal treatment (surgery, chemotherapy and radiotherapy) for cancer will also be addressed in this program.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for gastroenterological surgery, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Integrated knowledge of each disease of digestive surgery  
2) Integrated knowledge of digestive surgery treatments for each diseases  
3) Integrated knowledge of the mechanism of carcinogenesis, invasion and metastasis of digestive cancer  
4) Proposal of appropriate research projects on the basis of understanding the background on the gastroenterological surgery.

**A7 Study in Medical Sciences:  
Gastroenterological Surgery**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Hideo Baba et al.  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Gastroenterological Surgery

**【Course Description】** The methodology for analysis of the factors related to carcinogenesis and development of digestive cancer leading to the development of novel treatments will be addressed in this program. Furthermore, the methodology for analysis of biological response to surgical invasiveness and inflammation will be shed light on. Specifically, the experimental skill to analyze the gene alternation of cancer, develop the gene therapy, identify the cancer stem cells, investigate the expression of microRNA in cancer and clarify the mechanism of resistance of chemotherapy will be acquired in this program.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for gastroenterological surgery, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Acquisition of experimental skills to analyze the factor related to carcinogenesis and development of digestive cancer using by clinical samples  
2) Acquisition of experimental skill to detect the cancer specific genes  
3) Acquisition of abilities to make a proper experimental design and analysis to investigate the proposed hypothesis for digestive cancer  
4) Novel findings obtained by appropriate and proper analytical approaches.

**A6 Exercises in Medical Sciences:****Subject Code 10060****Thoracic Surgery · Breast Surgery****(Required: 8 credits)**

Supervisors: Makoto Suzuki (Thoracic Surgery) Yutaka Yamamoto (Breast and Endocrine Surgery)

Program schedule: year 1-2, every Friday (1st period)

Site and Facilities: Seminar room at the Department of Thoracic Surgery / Seminar room at the Department of Breast and Endocrine Surgery

**【Course Description】** (Thoracic Surgery) Recent advances of thoracic surgery depends on the following factors: 1) innovation of diagnostic imaging, 2) developments of optical devices and operative instruments, 3) evolving techniques for segmentectomy. Summarize these advances and extract issues with thoracic surgery. Second, Search literatures related to the issue and determine specific research project. Finally, the experimental results or clinical trials should be reported in international specific journals. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this departmental course.

(Breast and Endocrine Surgery) Surgical management and multi-modal treatment for the endocrine-related cancers or tumors, such as breast cancer, thyroid cancer, and other functional tumors, such as, parathyroid adenoma or hyperplasia with MEN (multiple endocrine neoplasia) and the functional tumors of adrenal gland, will be addressed in this practical series. Furthermore, the multimodal management of advanced cancer/recurrence breast cancer including chemotherapy, endocrine therapy and molecular targeting therapy will be discussed. In addition, the fundamental research works, such as the analyses of mechanism of breast cancer growth, especially estrogen dependent growth, and other genetic or serum markers for monitoring or predicting factors of breast cancer treatment, will be conducted by the instructors. The above-mentioned results of research will be published in an article and presented.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation for Grades and Credits】** The evaluation of each person will be supported by each theme according to below points.

- 1) Understanding of state of art thoracic surgery. Understanding of state of art breast and endocrine surgery.
- 2) Novel findings obtained by appropriate and proper analytical approaches.
- 3) Inventing new therapy or diagnostic technology for thoracic surgery .breast and endocrine surgery.

**A7 Study in Medical Sciences:****Subject Code 10070****Thoracic Surgery · Breast Surgery****(Required: 8 credits)**

Supervisors: Makoto Suzuki (Thoracic Surgery) Yutaka Yamamoto (Breast and Endocrine Surgery)

Program schedule: year 1-2, every Monday (3rd period)

Site and Facilities: Seminar room at the Department of Thoracic Surgery / Seminar room at the Department of Breast and Endocrine Surgery

**【Course Description】** (Thoracic Surgery) Summarize advances of thoracic surgery and extract problem of these. Learn how to search literature. Understand the meaning of statistics in clinical research. Learn elementary skills of gene and and protein experiments..

(Breast and Endocrine Surgery) Surgical management and multi-modal treatment for the endocrine-related cancers or tumors, such as breast cancer, thyroid cancer, and other functional tumors, such as, parathyroid adenoma or hyperplasia with MEN (multiple endocrine neoplasia) and the functional tumors of adrenal gland, will be addressed in this practical series. Furthermore, the multimodal management of advanced cancer/recurrence breast cancer including chemotherapy, endocrine therapy and molecular targeting therapy will be discussed. In addition, the fundamental research works, such as the analyses of mechanism of breast cancer growth, especially estrogen dependent growth, and other genetic or serum markers for monitoring or predicting factors of breast cancer treatment, will be conducted by the instructors. The above-mentioned results of research will be published in an article.

**【Evaluation for Grades and Credits】** Grading will be based on active class participation, , paper summaries or final reports.

**【Evaluation Criteria】** The evaluation of each person will be supported by each theme according to below points.

- 1) Understanding state of art thoracic surgery.The clinical usefulness of prognostic and predictive factors for breast cancer treatment, especially for advanced/recurrent breast cancer will be discussed according to clinical research of patient's outcome.2) Acquisition of elementary skills of gene and protein experiments.3) Contriving logical/proper experimental design. The action and dysfunction of the endocrine organs, such as thyroid, parathyroid, adrenal grand will be reported.

**A6 Exercises in Medical Sciences:  
Cardiovascular Surgery**

**Subject Code 10060  
(Required:8 credits)**

Supervisors: Toshihiro Fukui, Ken Okamoto  
Program Schedule: year 1-2, every Tuesday (2nd period)  
Site and Facilities: seminar room and laboratories at Department of Cardiovascular Surgery

**【Course Description】** The aim of this Departmental Course is to learn 1) new knowledge regarding diseases of the cardiovascular system, 2) recent surgical procedures for cardiovascular disease and 3) how to propose a new surgical procedure for cardiovascular disease. The hypothesis must then be proven experimentally. Latest literatures, for example, regarding blood flow disturbance, cardiac dysfunction, angiogenesis, and tissue regeneration are searched. Experimental design will be constructed to develop a novel approach for therapeutic angiogenesis and myocardial regeneration using angiogenic growth factors and various stem cells. Finally, the experimental results should be reported in international scientific journals in the fields of cardiovascular medicine, cardiovascular surgery, regenerative medicine. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for cardiovascular surgery, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】**

The achievement will be evaluated according to the following criteria.

- 1) Understanding of latest knowledge regarding cardiovascular system and disease.
- 2) Understanding of physiological and molecular mechanisms for angiogenesis or tissue regeneration in cardiovascular system.
- 3) Proposal of appropriate research projects on the basis of understanding the cardiovascular abnormality.
- 4) Novel findings obtained by appropriate and proper analytical approaches.

**A7 Study in Medical Sciences:  
Cardiovascular Surgery**

**Subject Code 10070  
(Required:8 credits)**

Supervisors: Toshihiro Fukui, Ken Okamoto  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Cardiovascular Surgery

**【Course Description】** The aim of this class is to acquire the techniques to analyze cardiovascular system and abnormalities. Specifically, experimental techniques to be earned in this course include establishment of experimental models of animals including rat, mouse and dog, vascular anastomosis technique, angiogenic therapy and analysis of molecular markers. Advanced techniques to investigate angiogenesis or myocardial regeneration will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】**

The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models for myocardial ischemia or leg ischemia.
- 2) Acquisition of experimental skills to anastomose vessels and to produce angiogenesis.
- 3) Acquisition of experimental techniques to culture progenitor cells for angiogenesis or myogenesis.
- 4) Understanding of physiological and molecular mechanism of angiogenesis or myogenesis.
- 5) Experimental protocol for angiogenesis or myogenesis.

**A6 Exercises in Medical Sciences:  
Pediatric surgery and Transplantation**

Supervisor: Taizo Hibi

Program schedule : year 1-2, every Friday 1st periods

Site and facilities: : Department of Pediatric Surgery and Transplantation

**Subject Code 10060  
(Required: 8 credits)**

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of molecular pathogenesis of pediatric or neonatal surgical diseases, pathogenesis of hepatic failure, and to learn how to improve the outcome of liver transplantation. The hypothesis must be proven experimentally or clinically. On the basis of the results obtained, further experimental design or clinical works will be constructed to develop a novel approach for better treatment. Specific research projects to be executed should be determined by searching latest literatures related to the pediatric surgery or transplantation. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of the research work. Finally, the results should be reported in international scientific journals in the fields of pediatric surgery, general surgery, or transplantation. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for pediatric surgery and transplantation, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the pediatric surgical diseases or organ failure like a liver.
- 2) Understanding how to investigate molecular pathogenesis and host defense for pediatric surgical diseases or organ transplantation.
- 3) Logical/proper experimental design to identify the congenital anomalies, pediatric surgical diseases, and pathologies in the situation of organ transplant.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for pediatric surgical diseases or organ failures, but also to successful development of diagnosis, prevention, and treatment for various diseases, including transplantation.

**A7 Study in Medical Sciences:  
Pediatric surgery and Transplantation**

Supervisor: Taizo Hibi

Program schedule : year 1-2, every Monday 1st periods

Site and facilities: Department of Pediatric Surgery and Transplantation

**Subject Code 10070  
(Required: 8 credits)**

**【Course Description】** The aim of this class is to acquire the techniques to analyze the pathogenesis of pediatric surgical diseases. Specifically, experimental techniques to be earned in this course include establishment of experimental surgery in models of animals, such as mice and rats, and gene analysis related to specific diseases. The aim of Transplantation is to acquire the techniques to analyze host responses to transplant organs. Specifically, experimental techniques to be earned in this course include establishment of experimental model of organ transplantation, pharmacodynamics of the immunosuppressants, differentiation and analyze of the immuno-competent cells.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models for pediatric surgical diseases
- 2) Understanding the clinical status of living donor liver transplantation
- 3) Understanding how to detect and identify the phenotype of specific model of congenital anomalies
- 4) Acquisition of experimental skills to produce animal models of transplantation.
- 5) Understanding of the techniques of gene-analysis to identify the pathogenesis of some congenital anomalies
- 6) Understanding how to detect and identify immuno-competent cells, related proteins and genes
- 7) Acquisition of abilities to make a proper experimental design and analysis to investigate the proposed hypothesis for pathogenesis of pediatric surgical diseases
- 8) Understanding of pharmacodynamics of immunosuppressants

**A6 Exercises in Medical Sciences:  
Neurosurgery**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Akitake Mukasa, Tadashi Hamasaki, Naoki Shinojima  
Program Schedule: Years 1-2, every Monday (4th period)  
Site and Facilities: Department of Neurosurgery

**【Course Description】** The aim of this course is to teach the mechanisms underlying the molecular pathogenesis of malignant brain tumors. Specifically, an understanding of the molecular mechanisms of tumorigenesis such as mutation of the p53 gene and IDH1/2, methylation of the promoter region of the MGMT gene, EGFR amplification and chromosome 1p/19q deletion will be gained. The correlation between these gene mutations and prognosis, and the role of chemokines such as MCP-1 in tumorigenesis will be addressed. A solid understanding of tumor immunology will be acquired.

**【Evaluation, Grades and Credits】** Students will receive course grades and credits based on the course hours completed, their understanding and knowledge of course material, and their comprehension of scientific information and recent progress made in brain tumor treatment.

**【Evaluation Criteria】**

The reports of students who completed more than 75% of the course hours will be evaluated. Transcripts of lectures will be available electronically via the internet.

Student achievement will be evaluated based on the following criteria:

1. An understanding of the molecular mechanisms of tumorigenesis
2. An understanding of the role of molecular pathogenesis such as p53 mutation, IDH1/2 mutation and chromosome 1p/19q deletion on tumorigenesis
3. An understanding of the mechanisms of gene modification such as methylation and amplification
4. An understanding of the role of chemokines produced by the brain tumor on tumorigenesis
5. An understanding of the biological properties of glioma cancer stem cells.

**A7 Study in Medical Sciences:  
Neurosurgery**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Akitake Mukasa, Tadashi Hamasaki, Naoki Shinojima

Program Schedule: Years 1-2, every Monday (3rd period)

Site and Facilities: Department of Neurosurgery

**【Course Description】** The aim of this course is to teach techniques for the analysis of gene mutations related to glioma. Specifically, the preparation of DNA and mRNA from cell lines and tissue specimens will be taught. In addition, students will learn how to (1) analyze gene sequences based on PCR assay of the p53 and IDH1, (2) analyze gene methylation based on methylation specific PCR for the MGMT, (3) analyze gene amplification of EGFR and chromosome 1p/19 deletion based on FISH assay. Experimental techniques taught in this course include Western blotting, immunohistochemistry, and in situ hybridization.

**【Evaluation, Grades and Credits】** Students will receive course grades and credits based on the course hours completed and their understanding and knowledge of course material. Students will receive course grades and credits based on the course hours completed, their understanding and knowledge of course material, and their comprehension of scientific information and recent progress made in brain tumor treatment.

**【Evaluation Criteria】**

The reports of students who completed more than 75% of the course hours will be evaluated. Transcripts of lectures will be available electronically via the internet.

Student achievement will be evaluated based on the following criteria:

1. An understanding of how to analyze gene mutations in glioma
2. An understanding of how to prepare DNA and mRNA from cell lines and tissue specimens
3. An understanding of how to perform PCR assay to analyze p53 and IDH1 gene mutations and an understanding of the analysis of DNA sequences
4. An understanding of the method for methylation specific PCR to analyze MGMT promoter
5. An understanding of the method for FISH to analyze EGFR gene amplification and chromosome 1p/19q deletion.
6. An understanding of the method for Western blotting, immunohistochemistry, and in situ hybridization

**A6 Exercises in Medical Sciences:  
Orthopaedic**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Takeshi Miyamoto, Toru Fujimoto, Tatsuki Karasugi

Program Schedule: years 1-2, each Friday (1st period)

Site and Facilities: Seminar room and laboratories in the Department of Orthopaedic Surgery

**【Course Description】** With a focus on (1) molecular mechanisms regulating the destruction and repair of musculoskeletal tissues, (2) basic research aimed at the regeneration of musculoskeletal tissues, and (3) molecular genetic approaches to musculoskeletal disease, we introduce recent advances in basic research in these fields. We instruct the establishment of hypotheses guiding individual studies and the testing thereof. In addition, we provide instruction on study design and the methodology necessary for the clinical verification of the diagnosis, the development of treatment strategies, and for disease prevention. We also address the pathologic analysis of musculoskeletal disease and discuss the literature in which specific cases are presented.

**【Evaluation for Grades and Credits】** Course grades and credits are based on the students' ability to understand and critique books and papers related to their research theme and on reports and oral presentations of their study design and progress. Students may substitute accepted research papers, conference presentations, or progress reports in laboratory meetings for these reports.

**【Evaluation Criteria】** Evaluations will focus on the following areas in each individual research project:

- 1) Ability to understand the results of clinical and basic research on musculoskeletal disease reported in English.
- 2) Ability to understand the basic principles of the analysis methods and the interpretation of the results of basic research on musculoskeletal disease.
- 3) Knowledge of the basic methodology and the interpretation of outcomes in clinical research studies on musculoskeletal disease.
- 4) Sufficient understanding of methodology to identify unresolved issues in musculoskeletal disease.
- 5) Knowledge of the results of earlier studies related to their research topic.

**A7 Study in Medical Sciences:  
Orthopaedic**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Takeshi Miyamoto, Toru Fujimoto, Tatsuki Karasugi

Program Schedule: years 1-2, each Monday (1st periods)

Site and Facilities: Seminar room and laboratories at the Department of Orthopaedic Surgery

**【Course Description】** Using animal models and cultured cells we instruct the experimental procedures of histology, biochemistry, and molecular biology to solve research problems identified during this course. Students will be instructed to design studies and to plan the methodology required for advancing clinical research, solving ethical issues, and obtaining medical statistics. We will provide instructions for basic or clinical research studies on musculoskeletal diseases aimed at elucidating their etiology and pathogenesis, at verifying and rendering a diagnosis, and at developing treatments and prevention methods. In addition, we provide instructions on the methods for summarizing the results of such studies in written reports and oral presentations.

**【Evaluation for Grades and Credits】** Course grades and credits are based on the mastery of the methodology related to the research topic, on the quality of oral presentations and reports interpreting their results, and on the outcome of individual research efforts. Students may substitute accepted research papers, conference presentations, or progress reports in laboratory meetings for these reports.

**【Evaluation Criteria】** Evaluations will focus on the following areas in each individual research project:

- 1) Acquisition of a variety of experimental skills and techniques required for orthopedic research and of novel findings that contribute to the field of orthopedics.
- 2) Sufficient knowledge regarding the methodology necessary for clinical research on musculoskeletal disease.
- 3) Development of an appropriate study design for the elucidation of the etiology and pathogenesis of musculoskeletal disease or for the verification and development of a diagnosis, for treatment, and for disease prevention.
- 4) Planning and execution of appropriate methodologies and study designs to solve research problems.



**A6 Exercises in Medical Sciences:  
Obstetrics and Gynecology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Eiji Kondoh, Takashi Ohba, Hironori Tashiro, Takaeshi Motohara  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Obstetric and Gynecology

**【Course Description】**

**Obstetrics:** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of cellular function in human placenta, and identification of the protein(s) maintain cross talk between the cells that control human placental function. The hypothesis must then be proven experimentally. Specific research projects should be determined by searching latest literatures related to the placental physiology and pathology. Experimental design will be constructed to develop a novel approach to identify the molecules for recognition and degradation of placental human chorionic gonadotropin (hCG). Further studies will be constructed to study the distribution and function of the molecules, and the correlation with clinical findings. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of Reproductive Physiology, Biology and/or Endocrinology. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**Gynecology:** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the carcinogenesis in gynecologic cancers including precancerous lesions (*e.g.* endometriosis), and to verify the hypothesis using the technique in molecular biology and pathology. Specific research projects should be determined by searching latest literatures related to the molecular biology and pathology. Experimental design will be constructed to develop a novel approach to identify using human tissue-materials and immortalized human ovarian surface epithelial cells in ovarian carcinogenesis, and using recombinant mice having murine *PTEN* mutation in endometrial carcinogenesis. Further studies will be constructed to study the distribution and function of the molecules, and the correlation with clinical findings. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of Gynecology. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for recognition and degradation of placental gonadotropins, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

**Obstetrics:**

- 1) Proposal of appropriate research projects on the basis of understanding the background on the placental physiology and pathology.
- 2) Proposal of appropriate research projects on the basis of understanding the background on the physiological role of placental macrophage.
- 3) Original and innovative findings that can contribute not only to better understanding for microbial pathogenesis and host defense but also to successful development of diagnosis, prevention, and treatment of various diseases.

**Gynecology:**

- 1) Proposal of appropriate research projects on the basis of understanding the background on the normal ovarian and endometrial physiology.
- 2) Proposal of appropriate research projects on the improvement of understanding the ovarian and endometrial carcinogenesis.
- 3) Logical and proper experimental design to identify the pathogenic and host defense factors.
- 4) Original and innovative findings that can contribute not only to better understanding for pathogenesis but also to successful development of diagnosis, prevention, and treatment of ovarian and endometrial carcinomas.

**A7 Study in Medical Sciences:  
Obstetrics and Gynecology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Eiji Kondoh, Takashi Ohba, Hironori Tashiro, Takeshi Motohara  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at Department of Obstetric and Gynecology

**【Course Description】**

**Obstetrics:** The aim of this class is to acquire the techniques to perform human *in vitro* fertilization and embryo transfer (IVF-ET). Experimental techniques to be earned in this course include the incubation of gametes / embryo, insemination, quality estimation and transfer of the embryo using experimental animals, such as mice. Particular emphasis is placed also on the establishment of co-culture system of embryo with feeder cell layer, intracytoplasmic sperm injection (ICSI). The students are also encouraged to take the embryologist's licenses. All of above will be thoroughly studied in this Departmental Course.

**Gynecology:** The aim of this class is to acquire the techniques to perform the research. Experimental techniques to be earned in this course include establishment of experimental models of animals and cultured cells, and analysis of various factors and host immune system. Particular emphasis is placed also on the establishment of culture system using immortalized human ovarian surface epithelial cells and/or macrophages, and the establishment of recombinant mice model, and advanced techniques of immunohistochemistry and molecular biology. All of above will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for IVF-ET, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

**Obstetrics:**

- 1) Proposal of appropriate research projects on the basis of understanding the background of IVF-ET program.
- 2) Logical / proper experimental design to improve the oocyte / embryo quality.
- 3) Novel findings obtained by appropriate and proper analytical approaches to improve the microenvironment of oocyte / embryo culture including co-culture system using human immortalized cell lines.

**Gynecology:**

- 1) Understanding how to culture cells and to breed animals.
- 2) Acquisition of experimental skills to analyze immunohistochemistry and molecular biology, to culture cells and to produce animal models for the gynecologic cancers or its precancerous lesions.
- 3) Acquisition of experimental techniques to analyze various factors including immune system (*e.g.*, macrophage).

<b>A6 Exercises in Medical Sciences: Urology</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisor: Tomomi Kamba, Takanobu Motoshima Program Schedule: year 1-2 every Tuesday (1st period) Site and Facilities: seminar room and laboratories at Department of Urology	
<p><b>【Course Description】</b> As exemplified by cytokine therapy for renal cell carcinoma, BCG bladder instillation therapy for bladder cancer, and peptide vaccine therapy for prostate cancer, immunotherapy primarily tends to be effective against urological cancers. Although cancer treatment is now reaching a major turning point due to the emergence of molecular targeted drugs, actual response rate of those drugs falls below the outcome of clinical trials, and these drugs are far from being “miracle remedies” as it turns out they actually possess various problems including adverse effects. Therefore, to tackle those issues, course participants will establish multi-disciplinary therapy models including immunotherapy by using mouse models for urological cancers and analyzing the antitumor effects and immunological parameters with guidance by supervisors. Based on these research results, the participants will also be provided a guide on how to write research papers and give oral presentations.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Grades will be awarded depending on experimental techniques acquired by the participants. Course reports can be substituted by academic articles, presentations at academic meetings or progress reports at journal clubs or lab meetings.</p>	
<p><b>【Evaluation Criteria】</b> Amongst followings, appropriate points for each participant’s research project will be evaluated:</p> <ol style="list-style-type: none"> <li>1. Experimental techniques of examining immunological parameters (e.g. cytotoxic activity, cytokine production).</li> <li>2. Basic techniques for flow cytometry analysis.</li> <li>3. Skills of general tissue culture and understanding of its principle.</li> <li>4. Skills of gene expression analysis such as RT-PCR or northern blotting. Understanding of those principles.</li> <li>5. Ability to employ appropriate approaches, to plan experiments and to evaluate data upon a provided project.</li> </ol>	

<b>A7 Study in Medical Sciences: Urology</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisor: Tomomi Kamba, Takanobu Motoshima Program Schedule: year 1-2 every Tuesday (1st period) Site and Facilities: seminar room and laboratories at Department of Urology	
<p><b>【Course Description】</b> Lectures will be given regarding diagnosis, pathogenesis and treatment of urological cancer such as renal cell carcinoma, urothelial carcinoma, and prostate cancer. The latest data as for diagnostic methods, pathogenesis, surgical treatments, radiotherapy, chemotherapy, immunotherapy, endocrine therapy and molecular targeted therapy will be shown, and unsolved problems will be discussed. Based on those issues, course participants will be given a research project and be guided to take appropriate approaches and experimental methods (e.g. tissue culture, gene expression analysis, protein analysis, analysis of protease activity and immunohistochemistry) .</p>	
<p><b>【Evaluation for Grades and Credits】</b> Grades will be awarded depending on experimental skills acquired by the participants. Course reports can be substituted by academic articles, presentations at academic meetings or progress reports at journal clubs or lab meetings.</p>	
<p><b>【Evaluation Criteria】</b> Amongst followings, appropriate points for each participant’s research project will be evaluated:</p> <ol style="list-style-type: none"> <li>1. Understanding of current issues of urological cancers.</li> <li>2. Fundamental skills of experiments essential for basic research of urological cancers.</li> <li>3. Essential skills for clinical research of urological cancers including statistical analysis.</li> <li>4. Ability to employ appropriate approaches, to plan experiments and to evaluate data upon a provided project.</li> </ol>	

<b>A6 Exercises in Medical Sciences: Ophthalmology</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisor: Toshihiro Inoue Program Schedule: year 1-2, every Friday 1st period Site and Facilities: seminar room and laboratories at Department of Ophthalmology	
<p><b>【Course Description】</b> Since two major blindness disease including retinal diseases (diabetic retinopathy, age-related macular degeneration (AMD), etc) and glaucoma are caused by retinal cell death, neuro-protection and neuro -regeneration as a new strategies are needed. The aim of this Departmental Course is to learn how to investigate the mechanisms of molecular pathogenesis of these ocular diseases. We aim to demonstrate that how several molecules associated with cell death, neuro-protection and neuro-regeneration change its expression, by using some animal models of ocular disease such as glaucoma, ischemic-reperfusion, AMD. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach. Finally, the experimental results should be reported in international scientific journals in the fields of microbiology, biochemistry, molecular biology, cell biology, and/or infectious diseases. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for molecular pathogenesis of ocular disease, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b></p> <p>The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Understanding how to investigate molecular pathogenesis for ocular diseases.</li> <li>2) Understanding the principle of major methods in ophthalmic field and data interpretation.</li> <li>3) Understanding what analytical methods can be used to elucidate unresolved issues in ophthalmology.</li> <li>4) Understanding important findings in ophthalmology research.</li> </ol>	

<b>A7 Study in Medical Sciences: Ophthalmology</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisor: Toshihiro Inoue Program Schedule: year 1-2, every Monday 1st period Site and Facilities: seminar room and laboratories at Department of Ophthalmology	
<p><b>【Course Description】</b> The aim of this class is to acquire the techniques to analyze the molecular biology to various ocular diseases. Specifically, experimental techniques to be earned in this course include establishment of experimental models of animals, such as mice and rats, and cultured cells, and analysis of various signaling factors and molecules produced in cells and tissues. Particular emphasis is placed also on safe and proper handling of various pathogens (culture methods etc.), analytical methods for gene expression (RT-PCR, Northern blotting, in situ hybridization, etc), all of which will be thoroughly studied in this Departmental Course.</p>	
<p><b>【Evaluation for Grades and Credits】</b></p> <p>Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills and obtaining new experimental data about neuroprotection in ophthalmic field.</li> <li>2) Acquisition of experimental skills and obtaining new experimental data about neuroregeneration in ophthalmic field.</li> <li>3) To master the experimental technique and design and execute an appropriate experimental plan for the research theme.</li> </ol>	

**A6 Exercises in Medical Sciences:  
Otolaryngology-Head and Neck Surgery**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kohei Nishimoto

Program Schedule: year 1-2, every Tuesday 2nd period

Program Schedule: We contact it by the number of the student attending lectures appropriately.

**【Course Description】** Head and neck squamous cell carcinoma (HNSCC) is the sixth most common type of cancer worldwide. Although new therapeutic approaches, including fractionated radiotherapy, targeted chemotherapy, and concurrent radiotherapy and chemotherapy, have been recently evaluated, the improvement in overall survival in patients with HNSCC is still low. The term HNSCC comprises epithelial tumors that arise in the oral cavity, pharynx, larynx, and nasal cavity, with the main risk factors being alcohol and/or tobacco abuse. HNSCC results from the accumulation of numerous genetic and epigenetic alterations that occur in a multistep process. The molecular alterations displayed by human HNSCC affect several pathways that influence cell proliferation, apoptosis, differentiation, angiogenesis, inflammation, immune surveillance, and metastasis. In this subject, we aim to acquire general knowledge of HNSCC and recent literatures with basic science.

**【Keywords】** head and neck squamous carcinoma, pathology, molecular biology

**【Class Style】** PowerPoint will be used in lectures, and active participation in the discussion is encouraged. Extra classes or video lectures are considered for those who are regularly absent for unavoidable reasons.

**【Textbooks】** Textbooks are not specified, and handouts will be distributed.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. In addition, they can exchange it with a report with an article, society announcement.

**【Evaluation Criteria】**

An examination by the report will be performed for the person who attended more than 2/3 of the experiment. The report evaluates the following items.

- 1) Understanding of pathology, staging, etiology of HNSCC
- 2) Acquisition of skill to understand new findings in HNSCC research from literature
- 3) Drawing up an appropriate experiment plan for the research theme that you set and carrying it out.

**A7 Study in Medical Sciences:  
Otolaryngology-Head and Neck Surgery**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kohei Nishimoto

Program Schedule: year 1-2, every Monday 2nd period

Program Schedule: We contact it by the number of the student attending lectures appropriately.

**【Course Description】**

To explore and dissolve theme planned in “A6 Exercises in Medical Sciences”, students will learn following basic skills:

#1 To analyze protein and molecular in HNSCC

#2 To make HNSCC mouse model utilizing carcinogen and genetically modified mouse

#3 To introduce gene mutation into epithelium cells derived from HNSCC mouse model

**【Keywords】** head and neck squamous carcinoma, pathology, molecular biology

**【Class Style】**PowerPoint will be used in the lectures, and active participation in the discussion is encouraged. Extra classes or video lectures are considered for those who are regularly absent for unavoidable reasons.

**【Textbooks】** Textbooks are not specified, and handouts will be distributed.

**【Evaluation for Grades and Credits】**

Students will be evaluated by attendance rate, oral presentations and reports regarding planning of a research and results of a research. Published own papers and a presentation in a meeting will be utilized for the evaluation instead of the reports if they want.

**【Evaluation Criteria】**

Students whose attendance rates are over 2/3 can take examination by a report. The reports will be reevaluated for the following items;

- 1) Understanding of handling of small animals and guideline of animal experiments.
- 2) Obtaining results ready to publish.
- 3) Planning proper research theme to study HNSCC.
- 4) Carrying out planned research theme with acquired experimental technique.

**A6 Exercises in Medical Sciences:  
Oral & Maxillofacial Surgery**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Hideki Nakayama , Ryoji Yoshida  
Program Schedule: year 1-2, every Friday (4th period)  
Site and Facilities: to be announced

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of tumor metastasis of squamous cell carcinoma (SCC). The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for prevention and treatment of SCC. Specific research projects to be executed should be determined by searching latest literatures related to the tumor metastasis and histogenesis. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of oncology , histopathology, molecular biology, cell biology, and/or cancer. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for tumor pathogenesis and metastasis, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the tumor histogenesis and tumor metastasis.
- 2) Understanding how to investigate molecular pathogenesis .
- 3) Logical/proper experimental design to identify the pathogenic and metastatic factors.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for tumor histogenesis and metastasis but also to successful development of diagnosis, prevention, and treatment of SCC.

**A7 Study in Medical Sciences:  
Oral & Maxillofacial Surgery**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Hideki Nakayama, Ryoji Yoshida  
Program Schedule: year 1-2, every Friday (3rd periods)  
Site and Facilities: to be announced

**【Course Description】** The aim of this class is to acquire the techniques to analyze tumor histogenesis and metastasis. Specifically, experimental techniques to be learned in this course include establishment of experimental metastatic models of animals, such as nude mice , and cultured cells, and analysis of tumor growth signaling factors and tumor metastatic molecules produced in cells and tissues. Particular emphasis is placed also on safe and proper handling of various pathogens (culture methods etc.), identification and analysis of protein, analytical methods for DNA and RNA, , and advanced techniques to investigate intracellular signal transduction, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models for SCC metastasis.
- 2) Understanding how to detect and identify tumor protein, and determine their biological activities.
- 2) Acquisition of experimental techniques to produce recombinant genes and proteins of various SCC factors and metastatic molecules, so that their structures and functions can be accurately analyzed and understood.
- 4) Understanding of chemical reactivities, biological functions, identification/detection methods of tumor genes.
- 5) Acquisition of experimental skills to investigate signal transduction mechanisms in the metastatic animal models.

**A6 Exercises in Medical Sciences:  
Dermatology and Plastic Surger**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: FUKUSHIMA Satoshi, MASUGUCHI Shinichi,  
IGATA Toshikatsu, AOI Jun, MIYASHITA Azusa, MAKINO Katsunari, KAJIHARA Ikko,  
TOKUZUMI Aki, ONUMA Takehiro, KASHIWADA Kayo, KANEMARU Hisashi, NISHIMURA  
Yuki, SAWAMURA Soichiro, NAKASHIMA Satoko  
Program Schedule: year 1-2  
Site and Facilities: to be announced

**【Course Description】** The aim of this Departmental Course is to learn how to collect information for experiments about inflammatory skin diseases and skin tumors, including the epidemiological approach. On the basis of the results obtained, we will discuss the problems and design experimental procedures. Furthermore, we will develop a novel approach for the defense mechanism, aging and carcinogenesis of skin, by using the ultraviolet irradiation model mouse. In addition, pathological, biochemical, and molecular biological techniques will be studied to analyze the changes in the skin condition of some inflammatory diseases and tumors. Finally, the experimental results should be reported in scientific journals in the field of Dermatology.

**【Evaluation for Grade】** Students are evaluated for their course grades and credits based on the reports and attendance.

**【Evaluation Criteria】** The report evaluates the following items.

- 1) The latest knowledge of inflammatory skin diseases and the skin tumors is acquired, and novel results are obtained.
- 2) A molecular biological technique for analyzing the appearance of disease mechanism of the skin disorder is understood.
- 3) Method of a pathology and molecular biology experiments concerning the skin defense mechanism has been acquired.
- 4) An appropriate research topic is set for the skin disease defense mechanism or the carcinogenesis mechanism.
- 5) Knowledge related to the set research topic is acquired by the student, and an appropriate design of experiment is planned and executed.

**A7 Study in Medical Sciences:  
Dermatology and Plastic Surgery**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: FUKUSHIMA Satoshi, MASUGUCHI Shinichi,  
IGATA Toshikatsu, AOI Jun, MIYASHITA Azusa, MAKINO Katsunari, KAJIHARA Ikko,  
TOKUZUMI Aki, ONUMA Takehiro, KASHIWADA Kayo, KANEMARU Hisashi, NISHIMURA  
Yuki, SAWAMURA Soichiro, NAKASHIMA Satoko.  
Program Schedule: year 1-2  
Site and Facilities: to be announced

**【Course Description】** The aim of this course is to acquire pathological, immunohistochemical, PCR techniques, and cell culture from skin biopsy specimens for skin disease research. Moreover, particular emphasis is placed on safe and proper handling of experimental model mice with skin tumors induced by ultraviolet exposure. Results of the above-mentioned study are presented orally, and should be reported in scientific journals.

**【Evaluation for Grade】** Students are evaluated for their course grades and credits based on the reports and attendance.

**【Evaluation Criteria】** The report evaluates the following items.

- 1) Skin pathology and immunohistochemical technique are understood.
- 2) The cell culture from skin biopsy sample is understood.
- 3) The PCR method is understood.
- 4) Animal experiments concerning skin tumor generation are understood.
- 5) Experimental procedures are acquired to the set research topic, and an appropriate design of experiment is planned and executed.



<p><b>A6 Exercises in Medical Sciences: Anesthesiology</b></p> <p>Supervisor: Naoyuki Hirata  Program Schedule: year 1-2, every Friday (1st period)  Site and Facilities: seminar room and laboratories at Department of Anesthesiology</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of pain transmission and cardiovascular resuscitation. The hypothesis must then be proven by clinical or basic experiment. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for pain therapy or for cardiopulmonary resuscitation. Specific research projects to be executed should be determined by searching latest literatures related to the specific fields. Finally, the experimental results should be reported in international scientific journals. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for the specific fields, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Proposal of appropriate research projects on the basis of understanding the background on the filed of anesthesiology.</li> <li>2) Understanding how to investigate the mechanisms of pain transmission and cardiovascular resuscitation.</li> <li>3) Logical/proper experimental design to identify the scientific hypothesis.</li> <li>4) Novel findings obtained by appropriate and proper analytical approaches.</li> <li>5) Original and innovative findings that can contribute not only to better understanding for anesthesiology but also to successful development of new paradigm for pain treatment and cardiovascular resuscitation.</li> </ol>	

<p><b>A7 Study in Medical Sciences: Anesthesiology</b></p> <p>Supervisor: Naoyuki Hirata  Program Schedule: year 1-2, every Monday (1st periods)  Site and Facilities: seminar room and laboratories at Department of Anesthesiology</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this class is to acquire the techniques to analyze pain transmission and cardiovascular resuscitation. Specifically, experimental techniques to be earned in this course include establishment of experimental pain models of animals, such as mice and rats, and dog experimental cardiovascular resuscitation model. Particular emphasis is placed also on the attitude of pharmacological and physiological experiment.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills to produce animal models.</li> <li>2) Understanding how to evaluate the level of pain in the animal model.</li> <li>3) Understanding how to evaluate the neural state after cardiovascular resuscitation.</li> </ol>	

**A6 Exercises in Medical Sciences:  
Molecular Cell Biology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Kunitoshi Yamanaka

Program Schedule: year 1-2

Site and Facilities: small conference rooms at IMEG and laboratories at Dept. of Molecular Cell Biology

**【Course Description】** The aim of this class is to acquire the techniques to analyze mechanisms of cell homeostasis and growth and to understand such methodologies. Experimental techniques to be acquired and methodologies to be understood in this course include forward and reverse genetics to isolate mutants, methods of gene cloning, procedures of gene knockout and RNA interference, methods to visualize intracellular localization of gene products, procedures of large scale expression and purification of proteins, and biochemical and spectrometric methods to analyze purified proteins *in vitro*.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, ability to interpret experimental results, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Ability to understand recent progress in the field of mechanisms of cell homeostasis and growth and to find out unsolved issues.
- 2) Understanding how to address the issues on mechanisms of cell homeostasis and growth experimentally and ability to interpret experimental results.
- 3) Understanding principles, effectiveness and limitations of various experimental methods.
- 4) Planning and achievement of experiments with proper choice and combination of methods to address the issues.

**A7 Study in Medical Sciences:  
Molecular Cell Biology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Kunitoshi Yamanaka

Program Schedule: year 1-2

Site and Facilities: small conference rooms at IMEG and laboratories at Dept. of Molecular Cell Biology

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypotheses for the regulation of cell homeostasis and growth including dynamics and quality control of proteins, biogenesis and maintenance of organelles, cell cycle, and cell division. The hypothesis must be proven experimentally. Experiments should include isolation and characterization of mutants of model organisms such as *E. coli*, yeast, and worms, analysis of expression and intracellular localization of gene products, identification of interacting proteins, and *in vitro* biochemical and spectrometric analysis of purified proteins. The experimental results should be presented in scientific meetings, and finally should be published in international scientific journals in the field of molecular cell biology to fulfill requirements for Master's degree thesis.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, understanding and knowledge about scientific information on recent progress in the research field of the regulation of cell growth and homeostasis, ability to plan experiments, and ability to interpret and criticize the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the Master's degree research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Ability to propose novel hypotheses based on understanding the recent progress and finding unsolved issues on regulatory mechanisms of cell homeostasis and growth.
- 2) Understanding how to investigate mechanisms of cell homeostasis and growth and ability to propose proper research projects.
- 3) Proper experimental design to achieve the proposed research projects.
- 4) Novel findings, logical discussion, and publication of the research results concerning mechanisms of cell homeostasis and growth.

**A6 Exercises in Medical Sciences:  
Kidney Development**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Ryuichi Nishinakamura, Akio Kobayashi, Shunsuke Tanigawa  
Program Schedule: year 1-2, every Tuesday (2nd period)  
Site and Facilities: seminar room and laboratories at Department of Kidney Development

**【Course Description】** The aim of this course is to learn how to propose scientific hypothesis for the mechanisms of organogenesis, especially kidney development. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for regenerating the organs. Specific research projects to be executed should be determined by searching latest literatures related to organogenesis such as kidney development. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for organogenesis, especially kidney development, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Proposal of appropriate research projects on the basis of understanding the background on organogenesis, especially kidney development.  
2) Understanding how to investigate molecular mechanisms in kidney development.  
3) Logical/proper experimental design to identify mechanisms in kidney development.  
4) Novel findings obtained by appropriate and proper analytical approaches.

**A7 Study in Medical Sciences:  
Kidney Development**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Ryuichi Nishinakamura, Akio Kobayashi, Shunsuke Tanigawa  
Program Schedule: year 1-2, every Tuesday (1st periods)  
Site and Facilities: seminar room and laboratories at Department of Kidney Development

**【Course Description】** The aim of this class is to acquire the techniques to analyze organogenesis, especially kidney development. Specifically, experimental techniques to be earned in this course include establishment of genetically engineered mice, and analysis of gene functions both in vivo and in vitro. Particular emphasis is placed also on proper handling of embryonic stem cells, in situ hybridization, immunostaining, organ culture of the kidney, and overexpression and knockdown of genes of interest in cultured cells, all of which will be thoroughly studied in this course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Acquisition of experimental skills to produce and analyze genetically engineered animals.  
2) Understanding how to identify abnormalities and genetic interactions in the knockout mice.  
3) Acquisition of experimental techniques, including in situ hybridization, section immunostaining, organ culture, overexpression and knockdown in cultured cells, so that the functions of genes of interest can be accurately analyzed and understood.  
4) Acquisition of experimental skills to investigate signal transduction mechanisms in the kidney development.

**A6 Exercises in Medical Sciences:  
Brain Morphogenesis**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Kenji Shimamura and Jun Hatakeyama  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Brain Morphogenesis

**【Course Description】** The aim of this course is to understand the classical as well as recent findings and concepts in the field of developmental biology, in order to define research projects and scientific hypothesis for the mechanisms underlying development and evolution of the vertebrate brain. Current specific subjects of interest are regionalization, morphogenesis, and cell lineage of the embryonic brain. Proper experimental plans to address the issues raised by these subjects and to prove the working hypotheses will be settled accordingly. Multi-disciplinary approaches (molecular biology, biochemistry, cell biology, anatomy, histology, genetics, bioimaging, and embryology) are employed. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of the research. Finally, the experimental results are presented at domestic as well as international meetings and subjected to international scientific journals in the fields of developmental biology and neurobiology. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for master thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their understanding and knowledge obtained about notions of recent progress in the research for developmental biology and neurobiology, and ability for planning of experiments and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the pre-PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to some of the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the mechanisms of brain development.
- 2) Understanding how to investigate developmental biology and neurobiology in general.
- 3) Ability to design proper experiments and the logics to elucidate the mechanisms underlying brain development.
- 4) Novel findings obtained by proper analytical approaches.
- 5) Original and innovative findings that can contribute to the field of developmental biology and neurobiology.

**A7 Study in Medical Sciences:  
Brain Morphogenesis**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Kenji Shimamura and Jun Hatakeyama  
Program Schedule: year 1-2  
Site and Facilities: seminar room and laboratories at Department of Brain Morphogenesis

**【Course Description】** The aim of this class is to acquire the techniques to investigate mechanisms that regulate development of the vertebrate brain. Experimental techniques to be earned in this course include morphological and histological analyses of the developing neural tissues as well as expression of genes and their products. Experimental embryology such as manipulation of the living embryos, and cell and organ cultures derived from the embryonic brain, and genetic analysis using transgenic animals are expertise of our department. The basic molecular biological methods such as DNA analysis, plasmid construction, are also included. In addition, latest technologies are also encouraged to be studied by actively reading recent literature and attending to appropriate training courses. These skills and techniques will be thoroughly studied and trained in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to some of the following criteria.

- 1) Acquisition of experimental skills to perform proper genetic as well as surgical manipulations of the living embryos.
- 2) Understanding how to analyze phenotypes derived from embryological or genetic manipulations.
- 3) Understanding how to analyze functions of genes involved in regional specification and morphogenesis of the brain.
- 4) Acquisition of experimental techniques to produce recombinant genes and proteins to reveal their roles in development of brain tissues.
- 5) Understanding of relevance and significance of the results obtained from experiments for normal development.

**A6 Exercises in Medical Sciences:  
Cell Modulation**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Takumi Era

Program Schedule: The first half year 1-2, every Friday (1th period)

Site and Facilities: conference room and laboratories at Department of Cell Modulation, IMEG

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of differentiation and maintenance of pluripotent stem cells such as embryonic stem (ES) and induced pluripotent stem (iPS) cells. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for manipulation of ES-, iPS- and /or tissue stem cells. Specific research projects to be executed should be determined by searching latest literatures related to stem cell, development and regenerative medicine. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for the stem cell, Regenerative medicine and development mechanism, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the international fields. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on stem cell biology and developmental mechanisms.
- 2) Understanding how to investigate molecular basis of the stem cell regulation and differentiation.
- 3) Logical/proper experimental design to identify the factors that play an essential role in stem cell regulation.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for stem cell regulation but also to successful development of manipulation of pluripotent- and tissue stem cells.

**A7 Study in Medical Sciences:  
Cell Modulation**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Takumi Era

Program Schedule: The second half year 1-2, every Monday (1st periods)

Site and Facilities: conference room and laboratories at Department of Cell Modulation, IMEG

**【Course Description】** The aim of this class is to acquire the techniques to analyze mouse embryos. Specifically, experimental techniques to be earned in this course include establishment of immunostaining, molecular and biochemical analyses for mouse embryos. Particular emphasis is placed also on establishment of knock-out mice and analytical methods for knock-out mice, and advanced techniques to induce ES cells into tissue stem cells and to manipulate ES cell by the methods of molecular biology, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to handle the mouse embryos.
- 2) Understanding how to do the histological analysis and stain the sections of mouse embryos.
- 3) Acquisition of experimental techniques to produce recombinant genes, so that their structures and functions can be accurately analyzed and understood.
- 4) Understanding of theme of the experiments and the plane of the experiments
- 5) Acquisition of experimental skills to make a hypothesis and to prove a hypothesis using proper experiments.

**A6 Exercises in Medical Sciences:  
Cell Maintenance**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Satoshi Tateishi  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Department of Cell Genetics

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the regulatory mechanisms of cell cycle, cell division and repair for damaged DNA. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for prevention and treatment of cancer. Specific research projects to be executed should be determined by searching latest literatures related to the cell cycle checkpoint, DNA repair, apoptosis (cell death) and cellular senescence. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of molecular biology, biochemistry, cell biology, cancer and/or genetic diseases. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for cell cycle checkpoint and DNA repair, apoptosis (cell death) and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the mechanisms of cell cycle checkpoint, apoptosis (cell death), cellular senescence and DNA repair.
- 2) Understanding how to investigate mechanisms of cell cycle checkpoint and tumor suppressor genes.
- 3) Novel findings obtained by appropriate and proper analytical approaches.
- 4) Original and innovative findings that can contribute for prevention, and treatment of cancer.

**A7 Study in Medical Sciences:  
Cell Maintenance**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Satoshi Tateishi  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at Cell Genetics

**【Course Description】** The aim of this class is to acquire the techniques to analyze DNA replication, recombination and repair using cultured mammalian cells. Specifically, experimental techniques to be earned in this course include identification and classification of disease using cultured cells from patient suffered from genetic disease defective for DNA repair. Particular emphasis is placed also on evaluation for cell cycle checkpoint, DNA repair, apoptosis (cell death) and cellular senescence and phenotypic analysis of mutant mice defective for the mechanisms. Advanced techniques to investigate intracellular signal response on DNA damages, all of which will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to produce animal models for cell cycle checkpoint, DNA repair, apoptosis (cell death) and cellular senescence.
- 2) Understanding how to detect and identify post-translational modifications of proteins following DNA damaging treatment of cultured cells, and determine their biological significance.
- 3) Acquisition of experimental techniques to produce recombinant genes and proteins of cell cycle checkpoint, DNA repair, apoptosis (cell death) and cellular senescence.
- 4) Acquisition of experimental techniques to analyze tumor formation in mutant mice.
- 5) Acquisition of experimental skills to explore the contribution of DNA repair and cell cycle control genes to maintenance of stem cells in mice.

**A6 Exercises in Medical Sciences:  
Cell Differentiation**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Minetaro Ogawa, Saori Koga  
Program Schedule: year 1-2, every Monday (1st period)  
Site and Facilities: laboratories at Department of Cell Differentiation

**【Course Description】** The aim of this class is to learn how to conduct research on the developmental processes of the hematopoietic and vascular systems. The latest literatures are examined to understand current status of the research fields, focusing largely on the molecular and cellular mechanisms underlying (1) establishment of the multiple potentials and self-renewal capability of hematopoietic stem cells and (2) development of the higher order architecture of the vascular system. Principles of the study tool including FACS purification of specific cell populations, in vitro differentiation of embryonic stem cells, genetically-engineered mice, as well as general molecular and cell biological approaches will be learned.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their understanding and knowledge earned about scientific information on recent progress in the research for the mechanisms of hematopoietic and vascular development. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Methodologies for identification and functional examination of stem cells are well understood.  
2) Genetical and cell biological approaches to investigate the hematopoietic and vascular development are learned.  
3) Methodologies for regulation of in vitro differentiation of embryonic stem cells are well understood.

**A7 Study in Medical Sciences:  
Cell Differentiation**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Minetaro Ogawa, Saori Koga  
Program Schedule: year 1-2, every Tuesday (1st periods)  
Site and Facilities: laboratories at Department of Cell Differentiation

**【Course Description】** The aim of this class is to acquire the techniques to investigate the mechanisms of developmental processes of the hematopoietic and vascular systems. Specifically, experimental techniques to be learned in this course include flow cytometry and cell sorting, in vitro colony formation assay of hematopoietic progenitor cells, long-term bone marrow cell culture, bone marrow cell transplantation, in vitro differentiation of hematopoietic and vascular cells from embryonic stem cells, and other cellular and molecular methodologies to analyze hematopoiesis and vascular development. These techniques are thoroughly studied and put into practice on a specific research project aimed at elucidation of the mechanisms of hematopoietic and vascular development. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results may be reported in academic meetings. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for a master thesis, are conducted in this course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.  
1) Methods for purification of stem cells by using flow cytometry are mastered.  
2) Methods for functional identification of hematopoietic stem cells are mastered.  
3) Cellular and molecular biological approaches to analyze hematopoiesis and vascular development are learned.  
4) Methods for in vitro differentiation of embryonic stem cells are mastered.  
5) A research project is properly set up to elucidate the mechanisms of hematopoietic and vascular development.  
6) Logical and proper experimental design is set up and performed to solve the problems.  
7) Research findings are properly presented and discussed in an academic environment.

**A6 Exercises in Medical Sciences:  
Pluripotent Stem Cell Biology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Hitoshi Niwa  
Program schedule: year 1-2, every Tuesday (3rd period)  
Site and Facilities: Seminar room of Laboratory of Pluripotent Stem Cell Biology

**【Course Description】**

The aim of this Departmental Course is to learn how to understand the molecular mechanism underlying the maintenance of pluripotency in stem cells at different molecular cell biological aspects such as signal transduction, transcriptional regulation and epigenetic regulation. To achieve this aim, the training is performed by the lecture and presentation in the progress meeting, discussion about the recent publications, and attending the scientific meeting. In addition, the practical training of molecular and cellular biological techniques is performed with the lectures for understanding their theoretical basis.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for molecular and cellular biology of pluripotent stem cells, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into account for evaluation.

**【Evaluation Criteria】**

The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the molecular mechanism governing pluripotency.
- 2) Understanding how to investigate molecular mechanism of the regulation of pluripotency.
- 3) Logical/proper experimental design to clear the mechanism of the regulation of pluripotency.

**A7 Study in Medical Sciences:  
Pluripotent Stem Cell Biology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Hitoshi Niwa  
Program schedule: year 1-2, every Tuesday (4th period)  
Site and Facilities: Seminar room of Laboratory of Pluripotent Stem Cell Biology

**【Course Description】** The aim of this class is to acquire the techniques to examine molecular mechanism on the regulation of pluripotency. Specifically, students are required to master the molecular and cellular biological techniques to analyze the functions of signal transduction, transcriptional regulation and epigenetic regulation in mouse embryonic stem cells.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills of molecular and cellular biological analyses
- 2) Acquisition of theoretical logics to design the experiments to analyze the molecular and cellular mechanisms governing pluripotency of mouse ES cells.



**A6 Exercises in Medical Sciences:  
Medical Cell Biology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Mitsuyoshi Nakao, Shinjiro Hino, Tomoaki Koga  
Program Schedule: year 1-2, every Friday (4th period)  
Site and Facilities: seminar room and laboratories at Department of Medical Cell Biology

**【Course Description】** The aim of this Departmental Course is to provide the molecular basis of epigenetic cell regulation in development and human diseases. The term epigenetics is defined as “heritable changes in gene expression that occur without a change in DNA sequence”. This is involved in determining cell identity in development, regeneration, aging and cancer. Students will perform medical science-oriented research by studying how cells establish, maintain or erase their identities by formation of transcriptionally active or inactive chromatin at specific genes. On the basis of the hypothesis and the results obtained, further experimental design will be constructed to discover a novel evidence for epigenetic cell regulation. Specific research projects to be executed should be determined after acquiring information from database and latest literatures related to the epigenetics. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals as well as conferences in the fields of cell biology, molecular biology, biochemistry and genetics. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about recent progress in the research for epigenetic cell regulation, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Understanding significance of epigenetics in life science.
- 2) Understanding relationship between epigenetics and human diseases.
- 3) Logical/proper experimental design to identify the mechanism of epigenetic cell regulation.
- 4) Novel findings obtained by appropriate and proper analytical approaches.
- 5) Original and innovative findings that can contribute not only to better understanding for epigenetic cell regulation but also to successful development of diagnosis, prevention, and treatment of human diseases.

**A7 Study in Medical Sciences:  
Medical Cell Biology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Mitsuyoshi Nakao, Shinjiro Hino, Tomoaki Koga  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at Department of Medical Cell Biology

**【Course Description】** This class covers the techniques to analyze the epigenetic cell and gene regulation. Specifically, experimental techniques to be earned in this course include various assays in cell biology, molecular biology, biochemistry and genetics, using cultured cells and experimental animals such as mice. Particular emphasis is placed on functional analysis of genes and proteins that are involved in epigenetic regulation important for development, regeneration, aging and cancer. Advanced techniques to investigate nuclear structure and function, and translational medical researches based on epigenetic studies for diagnosis, prevention and treatment of human diseases are also covered. All of above will be thoroughly studied in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills in cell biology, molecular biology, biochemistry and genetics.
- 2) Understanding the role of epigenetic mechanisms in physiology and human diseases.
- 3) Ability to design appropriate experiments and acquisition of techniques to investigate epigenetic cell regulation using recombinant DNAs and proteins for various factors.
- 4) Acquisition of experimental skills to investigate epigenome and chromatin in cultured cells and animals.

<b>A6 Exercises in Medical Sciences: Chromosome biology</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisors: Kei-ichiro Ishiguro Program schedule: year 1-2, every Monday (1st period) Site and Facilities: Seminar room and laboratories at Department of Chromosome biology, IMEG	
<b>【Course Description】</b> Meiosis is supposed to be a “special cell cycle process” that may modify the canonical mitotic cell cycle. Understanding the mechanisms how meiotic cell cycle is regulated for correct assembly of specialized chromosome structure and timely order of chromosomal events is important because dysregulation of meiosis often leads to infertility and pregnancy losses. The aim of this course is to learn how to propose scientific hypothesis, to conduct experiments and to present scientific data for the study on the molecular mechanisms of meiosis by reading and discussing about latest literatures related to the fields. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this course.	
<b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research field of chromosome biology and germ cell biology, and ability for experimental planning and interpretation and criticism of the results and data. The presentation and discussion at the laboratory and academic meetings is also taken into account for evaluation.	
<b>【Evaluation Criteria】</b>	

<b>A7 Study in Medical Sciences: Chromosome biology</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisors: Kei-ichiro Ishiguro Program schedule: year 1-2, every Tuesday (1st period) Site and Facilities: Seminar room and laboratories at Department of Chromosome biology, IMEG	
<b>【Course Description】</b> The aim of this course is to acquire 1) techniques to examine molecular mechanism on the regulation of meiosis and meiotic chromosome reorganization, 2) abilities to propose research projects and conduct experiments, 3) abilities to discuss and present about the research data. Specifically, thesis is mainly focused on (A) investigating the molecular mechanisms of induction of meiosis from mitotic state in precursor germ cells; (B) studying the molecular mechanisms of the cell cycle regulation that provide crucial differences between meiosis and mitosis; (C) studying the molecular basis of chromosomal structure that ensures the unique chromosomal events during meiosis.	
<b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by student’s presentation and discussion at the laboratory and academic meetings.	
<b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria. 1) Abilities to propose research projects and conduct experiments using appropriate technical methodology for chromosome biology and germ cell biology. 2) Experimental skills in molecular biology, biochemistry and cell biology. 3) Abilities to appropriately interpret the results and critically discuss about scientific data. 4) Presentation of the results and writing papers.	

**A6 Exercises in Medical Sciences:  
Muscle Development and Regeneration**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Yusuke Ono

Program schedule: year 1-2, every Wednesday (1st period)

Site and Facilities: Seminar room and laboratories at Department of Muscle Development and Regeneration

**【Course Description】**

The objective of this course is to learn recent advances in the research field of muscle development and regeneration. The course also provides an opportunity to learn about molecular and cellular mechanisms in pathogenesis of muscle-wasting diseases such as aging, disuse, and muscular dystrophy. Students acquire basic knowledge of molecular biology and biochemistry to study on muscle biology as well as reading comprehension skills on scientific papers through the laboratory meeting. Students are encouraged to attend scientific meetings, seminars, and conferences relevant to the area of muscle biology.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course credits and grades based on their knowledge relevant to their own research as well as reading comprehension skills on scientific papers. Presentation skills at the laboratory are also evaluated.

**【Evaluation Criteria】**

- 1) Acquisition of knowledge about recent progress in the research field of muscle biology.
- 2) Understanding of basic research techniques to study on muscle development and regeneration.
- 3) Proposal ability to develop their own research projects.

**A7 Study in Medical Sciences:  
Muscle Development and Regeneration**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Yusuke Ono

Program schedule: year 1-2, every Monday (1st period)

Site and Facilities: Seminar room and laboratories at Department of Muscle Development and Regeneration

**【Course Description】**

The objective of this course is to learn experimental techniques for elucidation of molecular and cellular mechanisms in muscle development and regeneration. Especially, the students acquire knowledge and skills on cell-culture, handling of genetically modified mice, molecular biology, biochemistry, and immunohistochemistry. Skills on isolation, culture, and analysis of muscle stem cells (satellite cells) are also acquired.

**【Evaluation for Grades and Credits】**

Students are evaluated for their course credits and grades based on experimental skills relevant to their own research projects. Presentation skills at the laboratory are also evaluated.

**【Evaluation Criteria】**

- 1) Acquisition of basic research techniques to study on muscle development and regeneration.
- 2) Proposal ability to develop their own research projects.

<p><b>A6 Exercises in Medical Sciences:</b>  <b>Morphogenesis</b>  Supervisors: Asako SHINDO  Program schedule: 1–2 year, Whole year  Site and Facilities: Laboratory (Department of morphogenesis, IMEG)</p>	<p><b>Subject Code 10060</b>  <b>(Required: 8 credits)</b></p>
<p><b>【Course Description】</b></p> <p>Department of morphogenesis focuses on cellular movements to form or repair organs during development using model animals. In this course, the students will read literature on morphogenesis to know how research is performed and understand how the field has contributed to basic medicine. The students make presentations in the seminars to acquire presentation skills and logical thinking for interpreting and discussing experimental results.</p>	
<p><b>【Evaluation for Grades and Credits】</b></p> <p>Assessed by the quality of presentation, discussion skills, and reading comprehension of scientific papers.</p>	
<p><b>【Evaluation Criteria】</b></p> <ul style="list-style-type: none"> <li>▪ Students can discuss data logically.</li> <li>▪ Students can make presentations logically.</li> <li>▪ Students can read a paper and understand its significance.</li> <li>▪ Students understand the fundamental findings in developmental biology and acquire logical thinking to perform scientific research.</li> </ul>	

<p><b>A7 Study in Medical Sciences:</b>  <b>Morphogenesis</b>    Supervisors: Asako SHINDO  Program schedule: 1–2 year, Whole year  Site and Facilities: Laboratory (Department of morphogenesis, IMEG)</p>	<p><b>Subject Code 10070</b>  <b>(Required: 8 credits)</b></p>
<p><b>【Course Description】</b></p> <p><i>Xenopus laevis</i> is one of the model animals in developmental biology and has contributed to understanding how the cells form or repair tissues during development. <i>Xenopus</i> embryo is a powerful tool to investigate molecular functions, gene expression, and cell behaviors <i>in vivo</i>. In this course, the students learn basic experiments, including <i>in vivo</i> 3D and 4D imaging, to explore molecular mechanisms of morphogenesis using <i>Xenopus</i> embryos. Mammalian models will be used to identify conserved molecular mechanisms among species that lead to understanding the pathology of congenital diseases.</p>	
<p><b>【Evaluation for Grades and Credits】</b></p> <p>Assessed by proficiency in molecular works, embryo experiments, and imaging analysis. The processes of obtaining results will also be considered.</p>	
<p><b>【Evaluation Criteria】</b></p> <ul style="list-style-type: none"> <li>▪ Students can apply practical skills properly to solve biological questions.</li> <li>▪ Students can continue process of trial-and-error to get results.</li> <li>▪ Students can discuss data actively and generate an idea to develop projects.</li> <li>▪ Students can improve methods and generate new techniques and ideas.</li> </ul>	

**A6 Exercises in Medical Sciences:  
Clinical Retrovirology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Takamasa Ueno  
Program Schedule: year 1-2, every Monday (3rd period)  
Site and Facilities: seminar room and laboratories at “Clinical Retrovirology”

**【Course Description】** The exercise which gave some examples is guided about the circumstances of the important discovery of a phenomenon in retrovirus research including human immunodeficiency virus (HIV) in recent years and the methodology for a setup of the hypothesis about the mechanism of the phenomenon, and its pathogenesis analysis. Furthermore, the exercise for understanding the new technique developed in recent years as well as a classic technique is guided in terms of a functional molecule, molecular biology and cell biology to analyze pathogenesis of retroviral infection.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on an oral presentation, a report, etc. about an understanding of the work relevant to a subject of research or a paper, the capability of criticism, and planning of an experimental design are evaluated collectively. In addition, it is replaceable with a report with a paper, a presentation in a conference, or the progress report in a lab meeting.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) The capability to understand updated achievements in research of retroviral infection.
- 2) Understanding the principle of the general method for analysis in retroviral infection research and the interpretation of a result.
- 3) Understanding possible methods to approach unsolved subjects in retroviral infection.
- 4) Understanding the important past discovery corresponding to the research task of retrovirus infection.

**A7 Study in Medical Sciences:  
Clinical Retrovirology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Takamasa Ueno  
Program Schedule: year 1-2, every Monday (1st periods)  
Site and Facilities: seminar room and laboratories at “Clinical Retrovirology”.

**【Course Description】** The aim of this class is to acquire the techniques to analyze samples from HIV-1 infected individuals (clinical cases or animal models) or in vitro model origin to understand the pathophysiology of HIV-1 infection. For example, individual viral sequence is determined by automated sequencer after amplification of specific gene from the samples by PCR. The sequence data are subjected to the phylogenetic analysis. In addition, experiments using pseudoviruses and cell sorter analyses are performed with regard to the cell mediated immunity and the humoral immunity including neutralizing antibody. With these techniques research program will be conducted to contribute not only to better understanding pathogenesis but also to successful development of prevention and treatment of HIV-1 infection. Finally, students will be trained for documentation and oral presentation of the experimental results obtained.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student’s presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills with respect to genetic and biological aspects and obtaining new findings.
- 2) Appropriate subject of study is proposed in regard to the pathogenesis of the HIV-1 infection and the development of prevention and treatment.
- 3) Whether the experimental design is appropriate to the subject of study proposed and executed properly.
- 4) Original findings that can contribute to understanding the pathogenesis of HIV-1 infection and successful development of prevention, and treatment of HIV-1 infection are obtained.

**A6 Exercises in Medical Sciences:  
Hematopoiesis**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Seiji Okada  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at Division of Hematopoiesis, Center for AIDS Research

**【Course Description】** The aim of this Departmental Course is to learn how to propose scientific hypothesis for the mechanisms of the interaction between hematopoietic-immune system and viral infection. The hypothesis must then be proven experimentally. On the basis of the results obtained, further experimental design will be constructed to develop a novel approach for prevention and treatment of viral diseases such as HIV-1 and Hepatitis C. Specific research projects to be executed should be determined by searching latest literatures related to the hematopoietic-immune system and viral infection. Research projects and working hypothesis can be modified and improved depending on the progress and achievement of research. Finally, the experimental results should be reported in international scientific journals in the fields of hematology, immunology, molecular biology, cell biology, and/or infectious diseases. All instructions in the above-mentioned processes, which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for microbial pathogenesis and host defense mechanism, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the hematopoietic-immune system and viral infection.
- 2) Understanding how to investigate the human infectious diseases and cancer using animal models.
- 3) Logical/proper experimental design to identify the interaction between hematopoietic-immune system and viral infection.
- 4) Novel findings obtained by appropriate and proper analytical approaches. (Molecular biology to animal model)
- 5) Original and innovative findings that can contribute to better understanding for hematopoietic-immune system and viral infection. .

**A7 Study in Medical Sciences:  
Hematopoiesis**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Seiji Okada  
Program Schedule: year 1-2, every Wednesday (1st periods)  
Site and Facilities: seminar room and laboratories at Division of Hematopoiesis, Center for AIDS Research

**【Course Description】** The aim of this class is to acquire the techniques to analyze interaction between hematopoietic-immune system and viral infection. Specifically, experimental techniques to be earned in this course include establishment of proper experimental animal models for human hematopoietic-immune system and viral infection. Particular emphasis is placed also on safe and proper handling of various pathogens in P2 and P3 facility, identification and analysis of human hematopoietic and immune system, analytical methods for viral infection (HIV-1, HCV), HIV-1 accessory molecules (Nef, Vif, Vpr, etc), development of well-characterized HIV-1 infection models with cultured cells and experimental animals, and advanced techniques to investigate intracellular signal transduction, all of which will be thoroughly studied in this Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to analyze the interaction between hematopoietic-immune system and viral infection.
- 2) Understanding and acquisition of experimental skills to produce proper animal models for human hematopoietic-immune system, human cancer and infectious diseases.
- 3) Acquisition of experimental techniques how to detect and identify hematopoietic and immune function *in vitro* and *in vivo*.
- 4) Designing and proceedings the Logical/proper experiment to identify the interaction between hematopoietic-immune system and viral infection.

**A6 Exercises in Medical Sciences:  
Infection and Hematopoiesis**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Shinya Suzu  
Program Schedule: year 1-2, every Friday (1st period)  
Site and Facilities: seminar room and laboratories at "Infection and Hematopoiesis"

**【Course Description】** The molecular process by which HIV-1 infection leads to the development of AIDS is still poorly understood, of which understanding is quite important to finally eradicate AIDS. In this program, the major focus is to unravel the molecular mechanism of HIV-1 pathogenesis and its relationship with dysfunctions and phenotypical changes in hematopoietic cell components. The experimental techniques or approaches will be cell biology, molecular biology, genetic engineering, protein chemistry, and immunochemical analyses. More specific aim is to identify the interplay between HIV-1 proteins and host proteins, and to clarify how the interplay contributes to host cells or viruses themselves, through several examples. Another specific aim is to identify chemicals and/or peptides that target HIV-1 proteins and evaluate them in terms of their anti-HIV-1 capability, through several examples. The instructions, including the planning of experimental design, experiments themselves, the appropriate interpretation of the results obtained, the submission of paper, and oral presentation, all of which are necessary to fulfill requirements for PhD thesis, are conducted in this Departmental Course.

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed. Their understanding and knowledge earned about scientific information on recent progress in the research for pathogenesis and host defense mechanism of HIV-1 infection, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the PhD research.

**【Evaluation Criteria】** The achievement will be evaluated based on their own subject and according to the following criteria.

- 1) The latest knowledge and original findings related to the pathogenesis of HIV-1 proteins
- 2) The latest knowledge and original findings related to host proteins/factors for HIV-1
- 3) The latest knowledge and original findings related to anti-HIV-1 drugs/chemicals/peptides
- 4) Enough knowledge about proposed project, and appropriate experimental design for their fulfillments.

**A7 Study in Medical Sciences:  
Infection and Hematopoiesis**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Shinya Suzu  
Program Schedule: year 1-2, every Wednesday (1st periods)  
Site and Facilities: seminar room and laboratories at "Infection and Hematopoiesis".

**【Course Description】** The aim of this program is to learn techniques, which are necessary to clarify the HIV-1 pathogenesis and the identification/evaluation of anti-HIV-1 chemicals/peptides. The specific techniques will be cell biology (e.g. analyses of cell functions), molecular biology (e.g. intracellular signal transduction analysis), genetic engineering (e.g. mutant cDNA preparation/expression), protein chemistry (e.g. protein-protein interaction analysis), and immunochemical analyses (e.g. immuno-fluorescence)

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated based on their own subject and according to the following criteria.

- 1) Skill on cell biology (e.g. phenotypical analyses with hematopoietic cells)
- 2) Skill on molecular biology (e.g. intracellular signal transduction analyses)
- 3) Skill on genetic engineering (e.g. mutant cDNA preparation/expression)
- 4) Skill on protein chemistry (e.g. protein-protein interaction analysis)
- 5) Skill on immunochemical analyses (e.g. immuno-fluorescence)

**A6 Exercises in Medical Sciences:  
Infection and Immunity**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Takamasa Ueno  
Program Schedule: year 1-2, every Tuesday (1st period)  
Site and Facilities: seminar room and laboratories at Joint Research Center for Chronic Viral Infection

**【Course Description】** The course is structured to expose students to the recent and important discoveries in HIV/AIDS biology as well as human antiviral immune responses and discuss how to perform research studies. The program will emphasize on how to raise their own scientific questions, to propose hypotheses, and to design experimental strategies to answer the questions by analyzing cells, proteins, and genes involved in antiviral immunity and viral pathogenesis. The focus will be on, but not limited to, functional aspects of human T cells, molecular basis of antigen recognition, as well as HIV accessory proteins. Based on their own findings, students are expected to write scientific manuscripts to be submitted to internationally recognized journals in the fields and give oral and poster presentations in academic conferences. All academic and scientific activities listed above are PhD course requirements and will be conducted under the supervision of the instructor.

**【Evaluation for Grades and Credits】** Grades will be based on attendance and overall performance in understanding and critically reviewing scientific literature, and quality of experimental design, findings, and presentations. Manuscripts for scientific papers and presentations at domestic/international conferences will be counted towards the overall course grade.

**【Evaluation Criteria】** Students will be evaluated by the following criteria:

- 1) their understandings of background and their research agendas in their own research interests.
  - 2) their understandings of the role of anti-HIV immune responses and viral pathogenesis.
  - 3) their ability to formulate scientific questions and hypotheses.
- their ability to implement strategic experimental design, accomplish research projects, and draw logical conclusions by evaluating their own experimental results.

**A7 Study in Medical Sciences:  
Infection and Immunity**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Takamasa Ueno  
Program Schedule: year 1-2, every Wednesday (1st periods)  
Site and Facilities: seminar room and laboratories at Joint Research Center for Chronic Viral Infection

**【Course Description】** The course is structured for students to learn experimental methods to address their scientific questions and test hypotheses. The program will emphasize on experimental techniques for viral replication, viral pathogenesis, human immune responses, flow-cytometric analysis of cellular functions, biochemical analysis of recombinant proteins, as well as gene technologies. The course will also cover how to work safely with biohazardous materials such as HIV.

**【Evaluation for Grades and Credits】** Grades will be based on attendance and overall performance in experimental techniques and skills learned during the course. Manuscripts for scientific papers and presentations at domestic/international conferences and intra-laboratory meetings will be counted towards the overall course grade.

**【Evaluation Criteria】** Students will be evaluated on to the following criteria:

- 1) their skills and knowledge to work safely with biologically hazardous materials.
  - 2) their skills and knowledge of viral replication and pathogenesis.
  - 3) their skills and knowledge to isolate and maintain cells involved in antiviral immune responses.
- their skills and knowledge to analyze functional aspects of cells, proteins, and genes.



**A6 Exercises in Medical Sciences:  
Genomics and Transcriptomics**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Yorifumi Sato

Program Schedule: year 1-2 every Wednesday (2nd period)

Site and Facilities: laboratories at “Genomics and Transcriptomics”

**【Course Description】**

The aim of this course is to understand the fundamental knowledge regarding virology, molecular cell biology, immunology, and genomic biology. Students make a presentation and have a discussion using the latest scientific paper to learn how the major scientific discovery was initiated, how to generate scientific hypothesis, and how to prove that experimentally. We aim to enable student make his or her own research project with help of supervisor. The students would understand their research project very well, make their own experimental plan, and perform that efficiently. In addition, students will be able to evaluate and discuss their findings and then make a scientific paper.

**【Evaluation for Grades and Credits】**

Students will be evaluated based on study hours of this course as well as their ability and performance to understand and evaluate the scientific papers used in this course. Students will also be evaluated by the performance of their research project.

**【Evaluation Criteria】**

- 1) Understanding about recent major finding about virology, molecular cell biology, immunology, and genomic biology. Also, performance of their own research project regarding these research fields.
- 2) Knowledge and understanding for the fundamental and latest notion about retroviral life cycle, persistent infection, and pathogenesis.
- 3) Experimental findings regarding retroviral latency.
- 4) Overall performance and understanding of scientific research project.

**A7 Study in Medical Sciences:  
Genomics and Transcriptomics**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Yorifumi Sato

Program Schedule: year 1-2 every Friday (1st period)

Site and Facilities: laboratories at “Genomics and Transcriptomics”

**【Course Description】**

This course aims to give the students the basic experimental skill for virology, molecular cell biology, and immunology. The students would use and apply these techniques to make progress in their research project regarding retroviral latency. This process will enable the students to learn about the methods of scientific research. Supervisor will support the student to make a scientific paper and presentation about their research findings.

**【Evaluation for Grades and Credits】**

Students will be evaluated based on study hours of this course as well as their learning of experimental skills, interpretation and presentation regarding the his or her own research. Evaluation can be performed by their presentation in the laboratory meeting instead of making report.

**【Evaluation Criteria】**

- 1) Experimental skills for cell culture, DNA extraction purification, PCR, and DNA sequencing.
- 2) Ability to apply the fundamental experimental techniques to their research project. In addition, the finding of their research project.
- 3) Experimental skills for handling of viral infected cells and analysis of provirus.
- 4) Performance about their research project, such as experimental skills and planning.

**A6 Exercises in Medical Sciences:  
Molecular Virology & Genetics**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Terumasa Ikeda

Program schedule: year 1-2, every Thursday (1st period)

Site and Facilities: Seminar room and laboratories at Division of Molecular Virology & Genetics

**【Course Description】**

This course is aiming at learning and understanding the following points.

- 1) Understanding host-virus interactions at molecular, cellular and individual levels; particularly mechanisms for host's defense and virus adaptation/evolution.
- 2) Comprehensively understanding host-virus interactions and learning approaches including virology, genetics, cell biology etc. by reading papers about own and the relevant research projects.
- 3) Deeply understanding host-virus interactions by interacting with researchers at international and domestic (Japanese society) conferences and seminars held in Kumamoto University.
- 4) Understanding theories for the fundamental techniques and skills required for investigating host-virus interactions.

**【Evaluation for Grades and Credits】**

Students will be comprehensively evaluated for course grades and credits based on the following points.

- 1) Understanding recent progress and important findings in virology, genetics, cell biology etc.
- 2) Ability to design research plans.
- 3) Ability to interpret the results obtained and design future research plans.
- 4) Presentations at the laboratory meeting and international and domestic (Japanese society) conferences will be considered for the evaluation.
- 5) Publications will also be considered for the evaluation.

**【Evaluation Criteria】**

The achievement will be evaluated according to the following criteria.

- 1) Learning ability to understand and explain recent progress and important findings in the research fields related to own projects.
- 2) Learning ability to understand and explain unresolved issues in the research fields related to own projects.
- 3) Learning ability to understand and explain the rationale of general analyses in the research fields of virology, genetics, cell biology etc.
- 4) Learning the ability to understand and explain the results which will be obtained by the general analyses in the research fields of virology, genetics, cell biology, etc.
- 5) Using the knowledge, learning ability to design research plans and explain them.

**A7 Study in Medical Sciences:  
Molecular Virology & Genetics**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Terumasa Ikeda

Program schedule: Schedule: year 1-2, every Monday (1st periods)

Site and Facilities: Seminar room and laboratories at Division of Molecular Virology & Genetics

**【Course Description】**

This course aims to learn and understand the following points.

- 1) Acquiring techniques and skills of virology, genetics, cell biology etc. using cell lines and primary cells required for addressing the proposals and resolving the questions on own research projects.
- 2) Using the acquired techniques and skills, learning basic research elucidating the host's defense and virus adaptation/evolution.
- 3) Learning applied researches for the development of antiviral drugs by expanding the obtained basic research.
- 4) Presenting the research results at the laboratory meeting and international and domestic (Japanese society) conferences.
- 5) Publishing the research results in authentic international journals.

**【Evaluation for Grades and Credits】**

Students will be comprehensively evaluated for course grades and credits based on the following points.

- 1) Acquiring techniques and skills required for addressing the proposals and resolving the questions on own research projects.
- 2) Acquiring the ability to interpret the results obtained and design the future research plans.
- 3) Presenting the research results at the laboratory meeting and international and domestic (Japanese society) conferences.
- 4) Publishing the research results in authentic international journals.

**【Evaluation Criteria】**

The achievement will be evaluated according to the following criteria.

- 1) Acquiring techniques and skills of virology, genetics, cell biology etc. required to elucidate host-virus interactions
- 2) Using the acquired techniques and skills, carrying out own research projects including basic and applied researches.
- 3) Carrying out own research projects by designing appropriate plans, and using the acquired techniques and skills
- 4) Presenting the research results at the laboratory meeting, and international and domestic (Japanese society) conferences.
- 5) Publishing the research results in authentic international journals.

**A6 Exercises in Medical Sciences:  
Virology and Pathology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisors: Takamasa Ueno, Takushi Nomura  
Program schedule: 1st - 2nd year, first semester, 1st period on Friday.  
Site and Facilities: In principle, at Room[411], Joint Research Center for Human Retrovirus Infection

**【Course Description】**

This seminar conducts to train students to acquire basic knowledge of infectious diseases and host immune response with the aim of developing professionals who can contribute to the control of infectious diseases. Students will learn about the mechanisms of virus transmission and pathogenicity and acquire the knowledge to handle viruses safely in the laboratory. This course provides exercises to accurately and efficiently collect the background insights necessary to achieve the research objective. This course also aims to develop the statistical and other basic knowledge necessary for data analysis.

**【Evaluation for Grades and Credits】**

The ability to collect accurate information from research articles related to the research project and to plan experiments to achieve the objective of research project will be comprehensively evaluated in this course through oral presentations, reports, etc.

**【Evaluation Criteria】**

Examination(s) by report will be given to those who have attended at least 75% of this course.

The report will be evaluated on the following criteria.

- (1) Understand the mechanisms of viral transmission and pathogenesis.
- (2) Understand the safe handling of pathogens.
- (3) Understand basic recombination techniques in the laboratory.
- (4) Understand techniques for analyzing host immune responses, especially cellular immunity.

**A7 Study in Medical Sciences:  
Virology and Pathology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisors: Takamasa Ueno, Takushi Nomura  
Program schedule: 1st - 2nd year, year-round, 1st period on Wednesday.  
Site and Facilities: In principle, at Room[411] and experimental rooms, Joint Research Center for Human Retrovirus Infection

**【Course Description】**

This seminar conducts to acquire basic skills in infectious diseases and host immune response with the aim of developing professionals who can contribute to the control of infectious diseases. Students learn techniques for preventing the spread of pathogens, as well as techniques for safely handling BSL2 or BSL3 level viruses in vitro/in vivo. Students generate mutant strains and proteins using recombination technology and evaluate their effects on immune function to analyze mechanism of virus-host interaction by using cellular immunity assays in this course. The goal is to develop new insights that will contribute to the control of viral infections.

**【Evaluation for Grades and Credits】**

The ability of experimental techniques, data analysis, and presentation techniques to achieve the research project will be comprehensively evaluated through oral presentations and reports in this course.

**【Evaluation Criteria】**

Examination(s) by report will be given to those who have attended at least 75% of this course

Oral/poster presentation on research at conference or workshop would be substituted for the report. The report will be evaluated on the following criteria.

- (1) Learn the safe handling techniques of pathogens in vitro/in vivo
- (2) Learn basic genetic recombination techniques
- (3) Learn basic host immune response analysis techniques (especially cellular immune response)
- (4) Establish suitable research subjects on virus-host interaction, and plan and perform appropriate experiments.

**A6 Exercises in Medical Sciences:  
Reproductive Technology**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Toru Takeo

Program Schedule: year 1-2 every Tuesday (2nd period)

Site and Facilities: seminar room and laboratories at Division

of Reproductive Engineering, Center for Animal Resources & Development (CARD)

**【Course Descriptio】** The aim of this Departmental Course is to learn the reproductive biology and the basic reproductive technology. In particular, you will understand the following.

1. Mouse early development
  - 1) Spermatogenesis
  - 2) Oogenesis
  - 3) Ovulation
  - 4) Fertilization
2. Reproductive technology
  - 1) In vitro fertilization
  - 2) Cryopreservation of embryos and sperm

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for the reproductive biology and the basic reproductive engineering techniques. The presentation including discussions at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the master's degree research.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Proposal of appropriate research projects on the basis of understanding the background on the reproductive biology and the basic reproductive engineering techniques.
- 2) Understanding how to investigate the reproductive engineering techniques in mice.
- 3) Logical/proper experimental design using reproductive engineering techniques to apply for mice.
- 4) Novel findings obtained by appropriate and proper analytical approaches.

**A7 Study in Medical Sciences:  
Reproductive Technology**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Toru Takeo

Program Schedule: year 1-2 every Friday (3rd period)

Site and Facilities: seminar room and laboratories at Division

of Reproductive Engineering, Center for Animal Resources & Development (CARD)

**【Course Description】** The aim of this class is to acquire the reproductive technology to apply for mice. Specifically, experimental techniques to be earned in this course include the following.

- 1) In vitro fertilization
- 2) Cryopreservation of embryos and sperm
- 3) Embryo transfer
- 4) Other new reproductive engineering techniques

**【Evaluation for Grades and Credits】** Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted with the assessment of each student's presentation and discussion at the laboratory and academic meetings.

**【Evaluation Criteria】** The achievement will be evaluated according to the following criteria.

- 1) Acquisition of experimental skills to do the basic reproductive engineering techniques in mice.
- 2) Acquisition of the main reproductive engineering techniques (In vitro fertilization, freezing of embryos and sperm, embryo transfer) to apply for mice.
- 3) Understanding the reproductive engineering techniques and their application for mice.
- 4) Development of the new reproductive engineering techniques in mice.

<p><b>A6 Exercises in Medical Sciences: Radioisotope science</b></p> <p>Supervisor: Akihiro Kojima Program Schedule: year 1-2, every Friday (1st period) Site and Facilities: seminar room and laboratories at Radioisotope Research Center</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this exercise is to learn the basic and applied experimental techniques to investigate the behavior and characteristics of a material using radioisotope tracer. In particular, instruction about a study related on molecular imaging in vivo is performed. After administration of radioactive probes for small animals or human, imaging for the distribution of those probes in the tissues, organs and lesions is targeted. Understanding for various imaging techniques and data-processing and -analysis methods and planning experiments are the main goal in this exercise.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge earned about scientific information on recent progress in the research for radioisotope molecular imaging, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the Master's degree research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Acquisition of the ability of comprehensive explanation for typical research results written in English related to radioisotope experiments.</li> <li>2) Acquisition of the ability of understanding general and applied radiation detection theories related to radioisotope experiments, and data analysis methods and their interpretation.</li> <li>3) Acquisition of the ability of understanding the necessity of radioisotope experiments and appropriate solutions for unsettled problems.</li> </ol>	

<p><b>A7 Study in Medical Sciences: Radioisotope science</b></p> <p>Supervisor: Akihiro Kojima Program Schedule: year 1-2, every Friday (1st period) Site and Facilities: seminar room and laboratories at Radioisotope Research Center</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this study is to perform experiments and discussions for the research theme planned through the exercise (A6: Radioisotope science). Quantification of radioactivity in vivo is explored in radioisotope molecular imaging. From various radioisotope molecular imaging methods, the best way is considered to obtain effective and optimized results. For clinical studies related to nuclear medicine using gamma camera, SPECT and PET systems, the investigation on the improvement of the quantitative method is instructed through the experiment with the anthropomorphic phantom. This study requires to present the research results and write a report.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, radioisotope experimental skill, experimental planning of research theme and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also taken into consideration to assess the level of achievement in the Master's degree research.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria for each student.</p> <ol style="list-style-type: none"> <li>1) Understanding of the classical and latest imaging techniques on investigation of molecular imaging with radioisotopes</li> <li>2) Obtaining of some original results for the further basic study related on the development of a molecular imaging methods, and image-data processing and analysis method, or for the clinical application of their methods.</li> <li>3) Planning a proper experiment for the purpose of the proposed research and execution of the experiment according to the plan.</li> </ol>	

<b>A6 Exercises in Medical Sciences: Disease Epigenetics</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
<p>Supervisors: Hiroto Ohguchi  Program schedule: 1<sup>st</sup> and 2<sup>nd</sup> grade, undetermined  Site and Facilities: Room 201 and Room 205 at Academic Common Honjo-1</p>	
<p><b>【Course Description】</b> The aim of this course is to acquire the skills of understanding the latest knowledges of epigenetic dysregulations related to human diseases, especially cancers.</p> <p>For this purpose,</p> <ol style="list-style-type: none"> <li>1) We'll read cutting edge and high quality papers at our journal club.</li> <li>2) We'll join the seminar and symposium related to our field.</li> <li>3) We'll teach the skills of molecular biology and epigenetic research at our lab meeting.</li> </ol>	
<p><b>【Evaluation for Grades and Credits】</b> Presentations, reports, papers</p>	
<p><b>【Evaluation Criteria】</b></p> <ol style="list-style-type: none"> <li>1) whether he/she understands the papers related to his/her thesis</li> <li>2) whether he/she understands experimental methods related to his/her thesis</li> <li>3) whether he/she understands how to plan the experiments</li> </ol>	

<b>A7 Study in Medical Sciences: Disease Epigenetics</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
<p>Supervisors: Hiroto Ohguchi  Program schedule: 1<sup>st</sup> and 2<sup>nd</sup> grade, undetermined  Site and Facilities: Room 201 and Room 205 at Academic Common Honjo-1</p>	
<p><b>【Course Description】</b>The aim of this course is to acquire the skills of planning and performing experiments, analyzing and interpreting the data, and presenting his/her research.</p> <p>For this purpose, we'll do his/her experimental training and have lab meeting.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Presentations, reports, papers</p>	
<p><b>【Evaluation Criteria】</b> whether he/she can plan and perform the experiments, analyze and interpret the data related to his/her thesis.</p>	



**A6 Exercises in Medical Sciences:  
Stem Cell Stress**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Hitoshi Takizawa  
Program Schedule: 1-2 years, every Monday (4<sup>th</sup> period)  
Site and Facilities: in the seminar room at International Research Center for Medical Sciences

**【Course Description】** The course is intended to expose students to the latest and important findings in the field of immunology and hematology, and discuss the background of the discoveries, how the hypothesis was formulated, and how the questions were addressed experimentally. Through these, the students are expected to study key cell types and molecules that are involved in immune-hematopoietic regulation, and general techniques of molecular, cellular, and developmental biology. Students are expected to prepare written and oral reports.

**【Evaluation for Grades and Credits】** Grades will be determined based upon attendance to the seminar, understanding the significance of the literatures introduced and the ability to criticize them. Also, we will grade students' overall performance, the quality of experimental design, oral presentations, and written reports.

**【Evaluation Criteria】** Students will be evaluated on the following topics:  
1) their understanding of research background on the paper introduced.  
2) their ability to communicate the significance of the study with other lab member.  
3) their understanding of significance and problem of the study.

**A7 Study in Medical Sciences:  
Stem Cell Stress**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Hitoshi Takizawa  
Program Schedule: 1-2 years, every Friday (1<sup>st</sup> period)  
Site and Facilities: in the seminar room at International Research Center for Medical Sciences

**【Course Description】** The course set a research project focusing on physiology or pathophysiology of human or mouse blood-forming hematopoietic and bone-forming mesenchymal stem cells, and introduce experimental approaches/techniques with knowledge on physiology, pathophysiology, cell biology, biochemistry, molecular biology, in order to address the key questions raised on the project on hematopoietic and mesenchymal stem cells. The student will also learn how to make a research report and how to present their own findings.

**【Evaluation for Grades and Credits】** Grades will be determined based upon attendance to the seminar, students' experimental techniques and skills learned during the course, and laboratory reports. A manuscript prepared for publication and presentations at the lab meetings or domestic/ international conferences may be substituted for written assignments.

**【Evaluation Criteria】** Students will be evaluated on the following topics:  
1) their progress on learning basic experimental techniques that are required for their research project  
2) their ability to design appropriate experiments, make experimental plans and make progress.  
3) their ability to present their progress in lab meetings and scientific meetings.  
4) their ability to write and present master thesis.

**A6 Exercises in Medical Sciences:  
Transcriptional Regulation in Leukemogenesis**

**Subject Code 10060  
(Required: 8 credits)**

Supervisor: Goro Sashida  
Program Schedule: year 1-2, every Wednesday (1th period)  
Site and Facilities: generally in the seminar room and laboratories at IRCMS

**【Course Description】** The course is structured to expose students to the latest and important findings on hematopoiesis and hematological malignancies and discuss how to have a hypothesis on the underlying mechanisms. The program will emphasize on how to examine a hypothesis experimentally by studying hematopoietic stem cells involved in hematopoiesis and/or leukemia. We will focus to study genes that play a role in hematopoietic stem cells and leukemia cells and also examine the regulation of genes and oncogenes, the structures of the gene products, and their biological function in vivo. Based on their empirical findings, students will design experimental systems, using biological, molecular, and biochemical techniques to understand the molecular functions of identified genes on hematopoiesis and oncogenes in leukemia. Students are expected to prepare written and oral reports.

**【Evaluation for Grades and Credits】** Grades will be based upon attendance, understanding literatures relevant to students' research and the ability to evaluate them, students' overall performance and the quality of project design, implementation, oral presentation, and written reports. A manuscript prepared for publication and presentations at the lab meetings or domestic/international conferences may be substituted for written assignments.

**【Evaluation Criteria】** Students will be evaluated on:  
1) their understanding of on hematopoietic stem cells and hematopoietic malignancies  
2) their knowledge of previous literature relevant to their research and their ability to form reasonable hypotheses and perform their experimental plans.

**A7 Study in Medical Sciences:  
Transcriptional Regulation in Leukemogenesis**

**Subject Code 10070  
(Required: 8 credits)**

Supervisor: Goro Sashida  
Program Schedule: year 1-2, every Wednesday (2th period)  
Site and Facilities: generally in the seminar room and laboratories at IRCMS

**【Course Description】** The course will emphasize on experimental methods including cellular and molecular techniques analyzing hematopoietic cells in mice. Students will learn how to analyze and isolate hematopoietic stem cells and leukemic cells to examine their biological function in mice. This course also covers molecular and biochemical methods to determine the function of oncogenes for hematopoietic malignancies.

**【Evaluation for Grades and Credits】** Grades will be based upon attendance, students' experimental techniques and skills learned during the course, and laboratory reports. A manuscript prepared for publication and presentations at the lab meetings or domestic/ international conferences may be substituted for written assignments.

**【Evaluation Criteria】** Students will be evaluated on:  
1) their knowledge of hematopoiesis and hematopoietic malignancies.  
2) their skills to isolate hematopoietic stem cells and analyze the functions.  
3) their skills to isolate hematopoietic malignant cells/leukemic cells and analyze the functions of tumor formation.  
4) their ability to form reasonable hypotheses and perform their experimental plans.

<p><b>A6 Exercises in Medical Sciences: Developmental Morphogenesis</b></p> <p>Supervisors: Guojun Sheng  Program schedule: 1年~2年 前期 Friday 2限  Site and Facilities: IRCMS seminar room and IRCMS Sheng lab space</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> In this course students will be introduced to the basic concepts in animal and human embryology. The focus will be on the early developmental stages, from fertilization to the onset of circulation, approximately covering the first four weeks in the human. Students will be trained to understand the evolutionary basis of human development, the separation of embryonic and extraembryonic tissues in development, the pluripotency and loss of pluripotency in development, the three principal germ layers and their derived cell lineages, cell polarity and cell movement in development, and molecular mechanisms regulating early animal development. Students will also be trained to propose and present a research project through supervised reading and discussion.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on: 1) their course hours completed, 2) their understanding of developmental biology and stem cell biology, 3) their critical thinking and communication skills and 4) their ability to present and discuss about their own and other people's research projects.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria:</p> <ol style="list-style-type: none"> <li>1) student's understanding of basic <b>embryology in the human and animals</b>.</li> <li>2) student's understanding of concepts of <b>pluripotency and lineage differentiation</b>.</li> <li>3) student's ability to read and understand <b>research papers</b>.</li> <li>4) student's ability to formulate and present a <b>research proposal</b>.</li> </ol>	

<p><b>A7 Studies in Medical Sciences: Developmental Morphogenesis</b></p> <p>Supervisors: Guojun Sheng  Program schedule: 1年~2年 前期 Thursday 2限  Site and Facilities: IRCMS seminar room and IRCMS Sheng lab space</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this course is to train students so that they acquire the basic techniques and skills needed to perform in vivo and in vitro experiments on early animal development. Students will learn techniques to culture pluripotent cells in vitro and to gain skills for analyzing mesoderm and endoderm differentiation in vivo. Students will also be exposed to tools for molecular and imaging analyses of animal development and for bioinformatics and omics analyses of embryonic tissues. Their experimental results will be reported in international scientific conferences or journals in the fields of <b>developmental biology, stem cell biology and cell biology</b>.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the 1) course hours completed, 2) their experimental skills and techniques acquired during this course, and 3) their reports submitted for evaluation.</p>	
<p><b>【Evaluation Criteria】</b> Student's achievement will be evaluated according to the following criteria:</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills to <b>culture human and chicken cells</b>.</li> <li>2) Acquisition of experimental skills to <b>perform molecular characterization</b> of pluripotent and differentiating cells.</li> <li>3) Acquisition of techniques to <b>isolate and analyze chicken embryos</b>.</li> <li>4) Acquisition of techniques to <b>culture chicken embryos ex ovo</b>.</li> <li>5) Acquisition of techniques to <b>manipulate gene expression in vivo</b>.</li> </ol>	

<b>A6 Exercises in Medical Sciences: Multi-dimensional imaging</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
<p>Supervisor: Hidenobu MIZUNO          Program schedule: 1<sup>st</sup> and 2<sup>nd</sup> year, Wednesday 1<sup>st</sup> period (tentative)          Site and Facilities: Seminar and experimental rooms in the IRCMS building</p>	
<p><b>【Course Description】</b> Students will learn basic knowledge about developmental neuroscience and in vivo imaging using literatures. Especially how the neuronal circuit develops during postnatal periods and how to observe the process of the circuit formation by two-photon microscope imaging.</p>	
<p><b>【Evaluation for Grades and Credits】</b>          Knowledge on the mechanisms for neuronal circuit development and in vivo imaging technique.</p>	
<p><b>【Evaluation Criteria】</b></p> <ol style="list-style-type: none"> <li>1) knowledge on neuronal circuit development upon studying literatures.</li> <li>2) progress in learning experimental methods related to the project.</li> <li>3) ability to make hypothesis and to design appropriate experiments for the research project.</li> </ol>	

<b>A7 Study in Medical Sciences: Multi-dimensional imaging</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
<p>Supervisor: Hidenobu MIZUNO          Program schedule: 1<sup>st</sup> and 2<sup>nd</sup> year, Monday 1<sup>st</sup> period (tentative)          Site and Facilities: Seminar and experimental rooms in the IRCMS building</p>	
<p><b>【Course Description】</b> In vivo imaging technique using two-photon microscope and related methods including molecular biology, histology, and computational data analysis etc will be described by a teacher. Students will also learn how to present their experimental results in the seminar and meeting.</p>	
<p><b>【Evaluation for Grades and Credits】</b>          How much students acquired the methods. Their presentation in the progress reports, scientific meetings and research papers will be evaluated.</p>	
<p><b>【Evaluation Criteria】</b></p> <ol style="list-style-type: none"> <li>1) progress in acquiring experimental methods related to the project.</li> <li>2) ability for presenting the results obtained by experiments.</li> </ol>	

<p><b>A6 Exercises in Medical Sciences: Skin Regeneration and Aging</b></p> <p>Supervisors: Aiko Sada  Program schedule: year 1-2, every Friday (1st period)  Site and Facilities: Seminar room and laboratory, International Research Center for Medical Sciences (IRCMS)</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> Stem cells maintain the tissue integrity during homeostasis and show remarkable plasticity to quickly respond to various stress or damages of the tissue. Dysfunction or misregulation of stem cells leads to tissue dysfunction, including impaired wound healing, cancer and aging. Emerging evidence suggests the presence of heterogeneous stem cell populations within adult tissues and their specific roles in physiological and pathological conditions. In this course, students will conduct research on skin stem cells during tissue regeneration and aging. The research goal is to reveal the drivers and effectors of stem cell dysfunction. Targeting these factors may prevent or cure diseases at the stem cell level, with implications for applications in regenerative therapy and for future treatments of cancer, aging and other disorders.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their understanding and knowledge on current research in the fields of stem cell, skin and aging biology, and ability for experimental planning and interpretation and criticism of the results obtained. The presentation including discussion at the laboratory and academic meetings is also considered for evaluation.</p>	
<p><b>【Evaluation Criteria】</b> The achievement will be evaluated according to the following criteria.</p> <ol style="list-style-type: none"> <li>1) Proposal of research projects in the fields of stem cell, skin and aging biology.</li> <li>2) Logical/proper experimental design to address cellular and molecular mechanisms of skin regeneration and aging.</li> <li>3) Experimental data obtained by appropriate approaches and interpretation.</li> <li>4) Original findings that can contribute to better understanding of skin, stem cell and aging biology.</li> </ol>	

<p><b>A7 Study in Medical Sciences: Skin Regeneration and Aging</b></p> <p>Supervisors: Aiko Sada  Program schedule: year 1-2, every Friday (1st period)  Site and Facilities: Seminar room and laboratory, International Research Center for Medical Sciences (IRCMS)</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b> The aim of this course is to acquire the techniques to examine cellular and molecular mechanisms on the regulation of skin regeneration and aging. Specifically, students are required to learn 1) phenotype analysis of transgenic mouse, 2) FACS isolation of epidermal stem cells, 3) molecular biology techniques (PCR, cloning etc), 4) primary culture of mouse and human keratinocytes, 5) omics analysis, and 6) staining and imaging.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Students are evaluated for their course grades and credits based on the course hours completed, their experimental skills and techniques acquired during this course, and reports submitted for evaluation. The report assessment can be substituted by the assessment of each student’s presentation and discussion at the laboratory and academic meetings.</p>	
<p><b>【Evaluation Criteria】</b></p> <p>The achievement will be evaluated according to followings. The required techniques depend on research project.</p> <ol style="list-style-type: none"> <li>1) Acquisition of experimental skills to perform basic molecular experiments.</li> <li>2) Acquisition of experimental skills to perform basic histological analysis and imaging.</li> <li>3) Acquisition of experimental techniques to analyze transgenic mouse phenotypes.</li> <li>4) Acquisition of experimental techniques to isolate epidermal stem cells, followed by omics analysis of these cells.</li> </ol>	

<b>A6 Exercises in Medical Sciences: Proteostasis in Sten Cell</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
<p>Supervisors: Kenichi Miharada  Program schedule: The first and second grade, the first semester, Monday, the first period  Site and Facilities: International Research Center for Medical Sciences</p>	
<p><b>【Course Description】</b> To understand how quantity and quality of proteins that directly affect a wide variety of biological processes/responses are properly regulated through literature study and discussions. In particular, students will learn how disruption of the mechanisms impact on the regulation of hematopoietic stem cells and fetal development.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Evaluation will be made based on the intelligibility of the student about the research theme through a report and oral presentation.</p>	
<p><b>【Evaluation Criteria】</b> Students who have attended more than 75 % of the course are requested to submit a report. In the report, the followings will be evaluated: knowledge about known regulatory mechanisms controlling protein quality control, and signaling pathways involved in the unfolded protein response; comprehension of biological features of hematopoietic stem cells; understanding of impact of the disrupted protein quality control and unfolded protein response in hematopoiesis and fetal development.</p>	

<b>A7 Study in Medical Sciences: Proteostasis in Stem Cell</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
<p>Supervisors: Kenichi Miharada  Program schedule: The first and second year, full year, Thursday, the third period  Site and Facilities: International Research Center for Medical Sciences</p>	
<p><b>【Course Description】</b> To understand how controls of quantity and quality of proteins are governed through literature study and experiments. Furthermore, students will grow their skill to investigate how disruption of the protein quality control mechanisms, particularly in hematopoietic stem cells and fetal development. Sin addition, students are expected be able to logically interpret their experimental result and to present the findings as a report and an oral presentation.</p>	
<p><b>【Evaluation for Grades and Credits】</b> Evaluation will be made based on the intelligibility of the student about the research theme through a report and oral presentation.</p>	

**【Evaluation Criteria】** Students who have attended more than 75 % of the course are requested to submit a report. In the report, the followings will be evaluated: understanding of known regulatory mechanisms controlling protein quality control, and signaling pathways involved in the unfolded protein response; logical interpretation and analysis of their own experimental data.

<p><b>A6 Exercises in Medical Sciences: Developmental Cardiology</b></p> <p>Supervisors: Yuichiro Arima  Program schedule: 1st ~ 2nd year, 1st semester, Friday, 1st period  Site and Facilities: IRCMS</p>	<p><b>Subject Code 10060 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b></p> <p>Students understand the formation of the heart and blood vessels along the developmental process, along with the formation mechanism of related diseases. In particular, we will focus on the involvement of metabolism in the process of myocardial differentiation and angiogenesis. Nucleic acid or protein expression analysis will be carried out in addition to the breeding method and sampling method of mice or rats. In addition, a pathological model is loaded during the adult period after stressing the perinatal environment. This will clarify the mechanism of increased disease risk.</p>	
<p><b>【Evaluation for Grades and Credits】</b></p> <p>Evaluation is performed by the papers related to the research theme. In addition, the questions and answers, reports, etc. related to the experimental plan will be comprehensively evaluated.</p>	
<p><b>【Evaluation Criteria】</b></p> <p>Report-based exams will be given to those with an attendance rate of 75% or higher in medical science exercises.</p> <p>The report evaluates the following items:</p> <ol style="list-style-type: none"> <li>1) Understand the difference between the primary and secondary heart fields.</li> <li>2) Understand the proper breeding and management of experimental animals.</li> <li>3) Understand the principle and usefulness of immunohistochemical staining as a method of tissue analysis.</li> <li>4) Understand RNA extraction and protein extraction using fresh frozen tissue.</li> </ol>	

<p><b>A7 Study in Medical Sciences: Developmental Cardiology</b></p> <p>Supervisors: Yuichiro Arima  Program schedule: 1st ~ 2nd year, 1st semester, Friday, 1st period  Site and Facilities: IRCMS</p>	<p><b>Subject Code 10070 (Required: 8 credits)</b></p>
<p><b>【Course Description】</b></p> <p>Students understand the process of cardiomyocyte differentiation and maturation, and understand the factors required for cardiomyocyte development. Differentiation of</p>	



cardiomyocytes is induced from iPS cells, and similarities and differences are clarified by comparing them with developing cardiomyocytes. Students understand the RNA or protein extraction method from cultured iPS cells, and learn how to compare the obtained samples with *in vivo* tissues.

**【Evaluation for Grades and Credits】**

Evaluation is performed by the degree of mastery of cell culture / tissue evaluation methods related to the research theme, and the formulation of experimental plans based on appropriate interpretation of the results.

**【Evaluation Criteria】**

Report-based examinations will be conducted for those with an attendance rate of 75% or higher in medical science research. Research reports at academic societies can be replaced with reports.

The report evaluates the following items:

- 1) Understand the advantages and disadvantages of cell experiments and animal experiments in cardiac development research.
- 2) Appropriate research topics are set.
- 3) An appropriate experimental plan is formulated and executed for the set research subject.

<b>A6 Exercises in Medical Sciences: Chromatin Organization in Immune Cell Development</b>	<b>Subject Code 10060 (Required: 8 credits)</b>
Supervisors: KUROTAKI, Daisuke Program schedule: First and second year Site and Facilities: International Research Center for Medical Sciences	
<b>【Course Description】</b> In this course, students will learn to understand the changes in epigenome, including 3D chromatin structure and histone modifications, during immune cell differentiation and immune response, and analysis techniques to clarify the importance of these changes in gene expression regulation. In particular, students will learn how to prepare various next generation sequencing libraries and bioinformatics analysis.	
<b>【Evaluation for Grades and Credits】</b> Students will be evaluated comprehensively based on their ability to understand and critique papers related to the research theme, as well as oral presentations and reports on the experiments.	
<b>【Evaluation Criteria】</b> Students with an attendance rate of 75% or higher in this class will be given a report-based examination. The reports will be evaluated on the following points: (1) To understand the theory of next generation sequencing technologies (2) To understand preparation methods of next generation sequencing libraries (3) To understand basic computational analysis methods for next generation sequencing data	

<b>A7 Study in Medical Sciences: Chromatin Organization in Immune Cell Development</b>	<b>Subject Code 10070 (Required: 8 credits)</b>
Supervisors: KUROTAKI, Daisuke Program schedule: First and second year Site and Facilities: International Research Center for Medical Sciences	
<b>【Course Description】</b> In order to understand the significance of 3D chromatin structure and histone modifications during immune cell differentiation and immune response, students will analyze the influence on gene expression after deletion of genomic regions and small molecule inhibitor treatment in immune cells. In particular, students will learn how to isolate immune cells from mice and how to induce differentiation of immune cells from bone marrow cells <i>in vitro</i> .	
<b>【Evaluation for Grades and Credits】</b> Students will be evaluated comprehensively based on their ability to understand and critique papers related to the research theme, as well as oral presentations and reports on the experiments.	

**【Evaluation Criteria】**

Students with an attendance rate of 75% or higher in this class will be given a report-based examination. The reports will be evaluated on the following points:

- (1) To understand how to analyze surface markers of immune cells by flow cytometry
- (2) To understand cell isolation methods using flow cytometry and magnetic beads
- (3) To understand how to induce differentiation of immune cells from mouse bone marrow cells