List of Major Subjects and Academic Advisors for 2024 Academic Year

*The major subjects and academic advisors may change as needed.

1）Department of Clinical Laboratory Sciences

Course Title	Course Aims and Research Subject
Graduate Thesis of Clinical Laboratory Sciences ICHINO Naohiro TAKEMATSU Hiromu NARUSE Hiroyuki IHIRA Masaru SUZUKI Koji MOURI Akihiro YAMAMOTO Yasuko	Highly specialized knowledge can be acquired by conducting research activities on research themes. You will develop the ability to promote a series of research activities, such as setting research themes, drafting research plans, analyzing experiments, and writing dissertations. ***ICHINO Naohiro*** Current ultrasonography has made it possible to measure tissue stiffness. We will provide research for the early detection and diagnosis of diseases by applying this technology. Specifically, research guidance will be provided on the following topics. 1. A novel scoring system for non-invasive and differential diagnosis of NAFLD/NASH. 2. Development of biomarkers for pre-arteriosclerosis diagnosis to preemptive medicine. ***TAKEMATSU Hiromu*** How to conduct research activity in the laboratory will be the starting point for development of researchers. Therefore, candidate students will be trained to acquire research skills. Following are projected studies students would be involved, aiming to understand still elusive functions of cellular glycans and lipids 1. Glycan-mediated signal modification downstream of B cell antigen receptor to produce antibody 2. CRISPR gene-editing screening for genetic understanding of cellular factors required for giant cell formation through endomitosis 3. Glycan/Lipid functional analyses utilizing genetically modified model organisms/cells ***NARUSE Hiroyuki*** Comprehensively analyze clinical data of various cardiovascular diseases and clarify the pathophysiology of the diseases. 1. Identification of high-risk plaques in patients with coronary artery disease 2. Efficacy of the COVID-19 vaccine in patients with cardiovascular disease ***SUZUKI Koji*** Through molecular epidemiological study using high-performance liquid chromatography and molecular biology techniques, we will contribute to elucidating the mechanism of lifestyle related diseases and aim to establish disease prevention from a new perspective. 1. Molecular epidemiological study on prevention of lifestyle-related diseases 2. Large-scale cohort study of cancer risk factors ***MOURI Akihiro*** Neuropsychiatric disorders such as Alzheimer's disease, Parkinson's disease, depression, schizophrenia, and autism are the targets of research and investigated using patients' blood and other clinical samples. We translate epidemiological and genetic findings in humans to mice and create mouse models of neuropsychiatric disorders to explore pathophysiology and pathogenesis using behavioral, pharmacological and neurochemical techniques. Based on the these studies, we try to develop new therapeutics, functional foods, and diagnostic biomarkers and conduct translational research to contribute healthy society and development of medicine. 1. Elucidating the pathophysiology of neuropsychiatric disorders using clinical samples and animal models 2. Developing pharmaceuticals and functional foods by basic research using animal models of neuropsychiatric diseases 3. Searching for biomarkers and developing diagnostic drugs for neuropsychiatric diseases

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Graduate Thesis of Clinical Laboratory Sciences ICHINO Naohiro TAKEMATSU Hiromu NARUSE Hiroyuki IHIRA Masaru SUZUKI Koji MOURI Akihiro YAMAMOTO Yasuko	***YAMAMOTO Yasuko*** We performed proteomic and metabolomic analyses using chronological database samples, including a group of patients at an increased risk of developing diseases, to develop diagnostic markers that allow the achievement of preemptive medicine. 1. Molecular analysis of biological functions using molecular biological methods 2. Metabolomic analysis of amino acid metabolism alterations 3. Behavioral analysis in animal models - Focusing on alterations in tryptophan metabolism

2）Department of Radiological Sciences

Course Title	Course Aims and Research Subject
Graduate Thesis of Radiological Sciences KOBAYASHI Shigeki ASADA Yasuki TAKATSU Yasuo	In this course, we conduct extensive research essential for the development of researchers and educators with knowledge of cutting-edge radiological science and technology. We analyze and understand the functions and structure of the human body using biometric information obtained from medical images, and practice and provide guidance on cutting-edge radiation medicine application research with a focus on research themes related to diagnostic imaging based on morphology and functional information. We provide paper guidance that can transmit information to society by presenting them in academic societies and academic journals in radiological sciences. ***KOBAYASHI Shigeki*** To understand the principles of photon-counting X-ray measurement and how to utilize energy information. We conduct a basic study on the imaging image and material identification function using a photon counting type X-ray detector and conduct research on the development of next-generation mammography for clinical use. For imaging modalities such as CT, MRI, and RI, we also conduct research on clinically useful software development using artificial intelligence (A.I.). ***ASADA Yasuki*** The aim is to study on radiation exposure of the diagnostic X-ray which the medical stuff included, to write a doctoral thesis. In that, to learn the choice of the study theme, the review of previous studies, planning of the study plan, experiment, and discussion in a series of process of writing paper. In addition, through the writing of the doctoral thesis, to learn the conscience of the scientist, the attitude toward study, an original idea, the way of the study. The theme is gathered to following three. 1. Study on evaluation of the patient doses for diagnostic X-ray examinations 2. Study on measurement of the patient doses for diagnostic X-ray examinations 3. Study on occupational radiation exposure of the medical stuff ***TAKATSU Yasuo*** 1. Pathological analysis using MR images 2. Quantitative evaluation of physical phenomena in MRI

3）Department of Biomedical Engineering

Course Title	Course Aims and Research Subject
Graduate Thesis of Biomedical Engineering IHIRA Masaru ITO Hiroyasu MIURA Yasuo FUJIGAKI Hidetsugu UMEZAWA Eizou	***IHIRA Masaru*** Our research is mainly focused on rapid diagnostic methods using isothermal gene amplification. The main research themes are the multiplex LAMP method using gene chips and a novel gene amplification method for using microRNA as a novel biomarker. 1. The development of rapid diagnostic methods as new biomarker using miRNA for myocardial infarction. 2. Development of multiplex LAMP method using gene chips 3. Study for natural history of herpes virus or rotavirus ***ITO Hiroyasu*** We develop new diagnostic and therapeutic methods for cancer and chronic infectious diseases using immunological approaches. 1. Elucidation of immune checkpoint mechanisms in cancer and chronic infectious diseases, and the development of new tests and treatments for these diseases. 2. Development of vaccine therapy against chronic hepatitis B virus infection. ***MIURA Yasuo*** Intercellular crosstalk among stem cells serves as a vital molecular mechanism within living organisms, intricately involved in maintaining the delicate balance of homeostasis within tissues and organs. Extensive research is dedicated to the comprehensive exploration of the secreted nanoscale particles, which assume the role of mediators in this intricate process. These particles exhibit a remarkable composition, encompassing a diverse array of essential components, including proteins, nucleic acids, lipids, and various other bioactive molecules. 1. Cultivation and functional analysis of tissue stem cells 2. Isolation of nanoparticles ***FUJIGAKI Hidetsugu*** The aim of our study is to develop diagnostic devices and therapeutic agents for several diseases such as tumors and mental diseases through biochemical analysis of biological information. 1. Development of biomarkers and diagnostic agents by metabolomic analysis using HPLC and mass spectrometry. 2. Development of therapeutic agents for tumors and psychiatric disorders targeting amino acid metabolism. ***UMEZAWA Eizou*** Water molecules in living systems move around randomly in diffusion motion. Diffusion MRI uses its statistical properties to obtain information about tissue microstructure and function. We use physics, mathematics, and mathematical data science to study diffusion MRI. 1. Study on diffusion MRI 2. Study on mathematical and physical foundation of MRI, and new imaging and analysis methods of MRI based on it.