

Master's Program in Life Science Innovation

Required Common Subjects

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC001	Introduction to Medicine	1	1.0	1	SprA	Fri5,6		Nobuyuki Hizawa, Masashi Yamazaki, Tsuyoshi Enomoto, 愛樹丸島, Kazutaka Aonuma, Junichi Shoda, Ikuo Sekine, Tatsuya Oda, Yunwen Zheng, Yuko Morishima	Malignant neoplasm, cardiovascular disease, and cerebrovascular disease have been major causes of death in Japan. Additionally, orthopedic disorder and trauma by athletics are common. This course will provide students with an overview of current states on pathological conditions, treatments, outcomes, and clinical problems about the diseases. In addition, the progress of research associated with the diseases will be reviewed.	Lectures are conducted in English. 主専攻必修科目。
01RC002	Introduction to Drug Discovery	4	1.0	1	SprB	Fri1,2		Masato Chiba, Hiraku Itatani, Daikichi Fukushima, Yasuhiro Yasutomi, Yoshinori Ikeura, Yusaku Miyamae	Student will study what kind of processes each pharmaceutical company goes through to place new drugs on the market and their original drug discovery strategy. Students will also study development and practical application of vaccines against infectious disease.	Lectures are conducted in English. 主専攻必修科目。
01RC003	Introduction to Food Science	1	1.0	1	FallA	Fri1,2		Mitsutoshi Nakajima, Hiroko Isoda, Kazuichi Sakamoto, Marcos Antonio das Neves, Sosaku Ichikawa	In this course, students will learn about food science, based on physical, chemical, biochemical, biological, and engineering approach from fundamental level to cutting-edge applied science technology.	Lectures are conducted in English. 主専攻必修科目。
01RC004	Introduction to BioResource	1	1.0	1	FallB	Fri1,2		Masatomo Kobayashi, Yukio Nakamura, Moriya Ohkuma, 淳吉木, Kuniya Abe, 真哉高橋	Students are expected to deeply understand the importance of bioresources and roles of resource centers in promoting life science innovation. In order to achieve the aim, professors who are responsible for experimental animal, experimental plant, cell bank and microorganisms in RIKEN BRC will give lectures on their resources including technologies and related information.	Lectures are conducted in English. 主専攻必修科目。
01RC005	Introduction to Natural History	5	1.0	1, 2	FallABC	by request		Toshiaki Kuramochi, Masanobu Higuchi, 真哉高橋	To introduce investigations on Natural History, several zoological and botanical researches will be reviewed. Taxonomy and diversity of parasitic helminth will be lectured and practiced, and lectures on the properties and distribution of flavonoid compounds in plants will also be given.	Lectures are conducted in English. 主専攻必修科目。
01RC006	Bioinformatics	5	1.0	1	SprAB	Fri4		Tetsuya Sakurai, Yasunori Futamura	In this course, students learn basic concepts and techniques in bioinformatics. Exercises using a computer will be provided to help understanding basic theories and learning practical skills.	Lectures are conducted in English. 主専攻必修科目。
01RC007	Management in Pharmaceuticals and Food	1	1.0	2	SprA	Fri5,6		Hiroko Isoda, Tadashi Terasaki, Hiroshi Akimoto, Nobuyuki Yamamoto	This course will provide students with an overview of current states on the intellectual property, management and investment on the business management on pharmaceutical, functional food and cosmetic industry concretely.	Lectures are conducted in English. 主専攻必修科目。
01RC008	Regulatory Science	1	1.0	2	SprA	Intensive		Yoshihiro Arakawa, Virginie Rage Andrieu, Cecil Le Gal Fontes, Hiroko Isoda	The Regulatory Science is defined as "The science to perform precise prediction, evaluation and judgment, and adjust results of science and technology to the most desirable state on investigation of persons and society for the purpose of applying results of science and technology to persons and society". In this lecture, we will describe about crucial roles that regulatory science plays for effectiveness, safety and guarantee of quality of pharmaceutical products and medical treatment devices in Japan and Europe.	Lectures are conducted in English. 主専攻必修科目。
01RC011	CITI: Responsible Conduct of Research	0	1.0	1	Annual	by request		真哉 高橋	CITI JAPAN e-learning will be provided via internet. Students will learn responsible conduct of research and rule of research.	主専攻必修科目。 eラーニング科目

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC012	Master's Internship Spring	0	1.0	1, 2	Spring Semester	by request		真哉 高橋	Students will experience employment and learn practical skills as a member of society in national or industrial research institutes, companies, ministries and agencies, and laboratories in this academic program.	Lectures are conducted in English.
01RC013	Master's Life Science Innovation Seminar	1	1.0	1	SprABC	Intensive		Colin Goding, Eric O'Neill, Hiroko Isoda, Panagis Filippakopoulos	Faculty from abroad associated with this program provide students with research topics in life sciences from basic to forefront. Students will acquire qualities of a researcher and the skills of presentation, discussion and communication by interacting with the lecturers.	Lectures are conducted in English. 主専攻必修科目。

Specialized Subjects in Disease Mechanism course

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC101	Molecular and Cellular Biology of Disease I	1	1.0	1, 2	SprAB	Intensive		Colin Goding, Eric O'Neill, Panagis Filippakopoulos, Jane Mellor, Mads Gyrd-Hansen, Eirikur Seingrimsdottir, Custodia Garcia Jimenez, Lionel Larue, Hiroko Isoda	This course provides an introduction to the principles of molecular and cellular biology and their connections to disease control. Lectures range from transcription regulation to models of diseases (in vivo) and provide insights into biological processes and how biological mechanisms underlie human disease (e.g. cancer) and physiology.	Lectures are conducted in English. 5/28-5/31
01RC102	Molecular and Cellular Biology of Disease II	1	1.0	1, 2	SprC	Intensive		Colin Goding, Eric O'Neill, Panagis Filippakopoulos, Jane Mellor, Mads Gyrd-Hansen, Eirikur Seingrimsdottir, Custodia Garcia Jimenez, Lionel Larue, Hiroko Isoda	This course complements Molecular and Cellular Biology of Disease I. Lectures range from cancer cell biology to relationship between deregulation of metabolism and cancer and provides current information in these fields of research.	Lectures are conducted in English. 7/23-7/27
01RC103	Advances in Cellular Regulation	1	1.0	1, 2	SprA	Mon1, 2		Renu Wadhwa Kaul, Yunwen Zheng, Tomoko Kuwahara, Atsushi Kuno, Yuzuru Ito	Students will study the state-of-the-art research topics in regenerative medicine, developmental biology, stem cell biology and cancer biology as well as therapy against disease and application to drug discovery.	Lectures are conducted in English.
01RC105	Prominent Discoveries in Neuroscience	1	1.0	1, 2	SprA	Tue/Thu 7		Masashi Yanagisawa, Hiroshi Nagase, Masanori Sakaguchi, Michael Lazarus, Hiromasa Funato, Qinghua Liu, Yoshihiro Urade	The goal of this omnibus course is to learn advanced principles in neuroscience, by reading "landmark" papers of historical significance in the broad area of neurobiology chosen by each instructor.	Code share with HBP Identical to 01EQ052 and 02RA185. Lectures are conducted in English.

Specialized Subjects in Drug Discovery course

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC201	Organic Chemistry / Chemical Biology	1	1.0	1, 2	FallA	Mon1, 2		Noriki Kutsumura, invalid, Tsuyoshi Saito, Takayuki Ohyoshi, Yoko Nagumo, Yusaku Miyamae	This course provides the basic organic chemistry required for learning about medicinal chemistry and chemical biology. Mini-exam and report (homework) will promote greater understanding of organic synthetic chemistry. Topics in chemical biology such as target identification and protein labeling will be also discussed.	Identical to 02RA171. Lectures are conducted in English.

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC202	Medicinal Chemistry / Pharmacology	1	1.0	1, 2	Fall B	Mon1, 2		Hiroshi Nagase, Setsu Endo, Yasuyuki Nagumo	This course provides the opportunities for students to learn characteristics of a living body, nature of water, the nature and role of the membrane, pharmacophore binding theory for drug design from the selection of drug targets, enzymes, the basis of receptor binding, how to discover new drugs, structure-activity relationship theory as well as application to drug development based on these. This course also provides the pharmacology required for drug discovery. Students will learn mode of action and mechanism of action of the drug, and the basis of the pharmacology from in vitro to in vivo. Furthermore, students will learn the effect of the physiologically active substance on the biological function in central nervous system, cardiovascular, immune/inflammatory system as well as chemotherapy.	Lectures are conducted in English.
01RC203	Translational Science in Drug Discovery	5	1.0	1, 2	Spr A	Wed1, 2		Sousuke Miyoshi, Akihiro Noda, Keiji Miyata, Katsumi Sudoh, Yoshihiro Murakami, Yusaku Miyamae	Translational Science has been of more importance to bridge basic research in the preclinical stage and patient care in the clinical stage. From drug discovery research point of view, it can enhance our understanding and confidence in targets, bringing potential compounds and biologics up to Proof of Concept earlier. Bio-imaging is a translatable tool from preclinical study to clinical study with same methodology such as PET MRI CT, to investigate pharmacokinetics, pharmacodynamics and efficacy especially in target organs with more minimally invasive.	Lectures are conducted in English.
01RC204	Drug Discovery Research and Project Management	1	1.0	1, 2	Spr B	Wed1, 2		Kentaro Yoshimatsu, Masahiro Yonaga, Hiroshi Kikuchi, Yusaku Miyamae	Promote an understanding of key elements/process of drug discovery research (selection of drug target, assay development, disease-model, lead compound finding, translational research, drug delivery, clinical development etc.) and project management, and provide the examples of specific drug discovery projects in Alzheimer's disease and cancer.	Lectures are conducted in English.
01RC205	Pharmaceutical Design Engineering	1	1.0	1, 2	Spr A	Fri1, 2		Sosaku Ichikawa, Tetsushi Taguchi, Guoping Chen, Shinji Sugiura, トシユキカナモリ	In this course, students will learn about physical chemistry and material science for the basis of pharmaceutical design and engineering. In addition, pharmacokinetics and pharmaceutical assay required for pharmaceutical design will be lectured. We will also provide advanced research topics and cutting-edge technologies in the related fields.	Lectures are conducted in English.

Specialized Subjects in Food Innovation course

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC301	Food Process Engineering	1	1.0	1, 2	Spr B	Intensive		Mitsutoshi Nakajima, Remko Boom, Marcos Antonio das Neves	In this course, students will learn about food process engineering, such as heating, freezing, and separation as well as basic principles of mass and heat transfer, reaction and food rheology.	Lectures are conducted in English.
01RC302	Food Functionality	1	1.0	1, 2	Fall B	Tue1, 2		Hiroko Isoda, Mari Yamamoto, Michel Larroque	Functional Foods are foods that have, in addition to their nutritive value, beneficial effect on health. This course discusses functional foods and their bioactive components, specifically their effect on cancer, allergy, neuronal regulation, regulation of metabolism including the mechanism of their effects.	Lectures are conducted in English.
01RC303	Food Safety	1	1.0	1, 2	Spr A	Thu1, 2		Kazutaka Yamamoto, Hitoshi Nagashima, Mitsutoshi Nakajima	Learn the basic elements of food safety: risk and hazard, chemical, biological, and physical hazards, toxicology, pasteurization/sterilization, and food safety standards.	Lectures are conducted in English.

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC304	Food Business	1	1.0	1, 2	SprA	Tue1, 2		Kenichi Kashiwagi, Mitsutoshi Nakajima	This lecture explores the extension of food business from the point of technology, economic and religious view, and discuss the development and innovation of food industry. (i) After an review of current status of technology among food industries, the strategic approach toward the smooth implementation of newly developed technology for establishing the innovative food industry. (ii) Reviewing producer's and consumer's behaviour and market mechanism in agro-food value chain and discuss the way to develop a new market of agro-food sector. (iii) Many religions have their own rules or laws such as "halal" in Islam, "Kosher" in Judaism, etc and they are deeply related with food business in certain regions. In this lecture, we focus on food and eating habits from the point of religious perspective. The lecture also talks about dietary culture based on the lecturer's fieldworks in Egypt, Tunisia, Turkey, France, Canada, etc.	Lectures are conducted in English.
01RC305	Nutrigenomics	1	1.0	1, 2	SprB	Thu1, 2		Kazuichi Sakamoto, Hiromi Hagiwara, Naoko Watanabe	Phytochemicals are critically involved in the regulation of a variety of signaling cascades and their essential gene expression, resulting in the protection of metabolic syndromes and anti-aging. In this class, students will learn about the physiological roles and their related-signaling cascade caused by phytochemicals in lipid metabolism, bone metabolism, melanogenesis, and inflammation, etc.	Lectures are conducted in English.

Specialized Subjects in Environmental Management course

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC401	Habitat and Functional Compound	1	1.0	1, 2					Finding medicinal plants which contain functional compounds and culturing them are the important issues in drug discovery and industrial production from natural products. In addition, environmental parameters such as soil condition and aridity define the content of functional compound. Lecture will cover the topics related to Natural product chemistry of medicinal plants, Screening of bioactive component from medicinal plants, Relation between soil condition and functional compound, Quality control of crude drugs, Drug discovery for tropical diseases from medicinal plants, Micropropagation of medicinal plants through tissue culture, Transformation of medicinal plants, Production of medicinal plants in plant factory and examples of applications.	Open in an odd number year. Lectures are conducted in English.
01RC402	Biomass Science	1	1.0	1, 2	FallB	Wed1, 2		Stephen Mayfield, 真哉 高橋, Makoto Watanabe	Focused on algae biomass, useful functions and compounds are introduced from the viewpoints of energy, food, health and life securities, then current status and future prospect of their business are shown and discussed.	Lectures are conducted in English.
01RC403	Water Environment and Life Science	1	1.0	1, 2	SprB	Tue1, 2		Maki Tsujimura, Motoo Utsumi, Hirofumi Hara	Water is one of the most important medium that determines the conditions of life and Water is cycling on earth, so that the dynamics of water environment is one of the key issues for controlling bioresource. On the other hand, biological method to quantify the hazardous contaminants such as endocrine disrupters that define the availability of water resource have been developed recent decades. Lecture will cover the topics related to dynamics of natural water environment: water cycle, climate change, diffusion of substances, hydraulics in stratified water body, material transportation and environmental risk assessment of endocrine disrupter, theoretically and practically.	Lectures are conducted in English.

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC404	Environmental Phycology	1	1.0	1, 2	SprAB	Tue3		Takeshi Nakayama, Yoshida Masaki, 正伸 河地, Ken-ichiro Ishida	藻類の進化, 系統, 生態について, 基礎生物学および環境科学の視点から解説する。	Identical to 02AF311.
01RC405	Environmental Medicine	1	1.0	1, 2	SprAB	Wed4		Yoshito Kumagai	This course aims to lead the students to acquire 1) better understanding of the condition of environmental substances existing in the air, water, soil and food products, and their biological effects on organisms and 2) skills for discussing the mechanisms of related adverse reactions.	Identical to 02RA124. Lectures are conducted in English.

Common Specialized Subjects

Course Number	Course Name	Course Type	Credits	Standard Academic Year	Course Offering Term	Weekday and Period	Classroom	Instructor	Course Overview	Remarks
01RC501	Life Science Innovation Master's Special Seminar I Fall	2	1.0	1	Fall Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will participate journal club in their laboratories, perform scientific presentation and discussion about the journal topics. Student will also take the obtained results into their own research.	Lectures are conducted in English. 主専攻必修科目。
01RC502	Life Science Innovation Master's Special Seminar I Spring	2	1.0	1	Spring Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will participate journal club in their laboratories, perform scientific presentation and discussion about the journal topics. Student will also take the obtained results into their own research.	Lectures are conducted in English. 主専攻必修科目。
01RC503	Life Science Innovation Master's Special Research I Fall	8	2.0	1	Fall Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will propose research projects and conduct research activities. Students will perform presentation about their research progress, deepen the discussion and correct the course of the research. Students will perform presentation at academic meetings and publish the result of their research and finally complete a master thesis or a report on specific subject research.	Lectures are conducted in English. 主専攻必修科目。
01RC504	Life Science Innovation Master's Special Research I Spring	8	2.0	1	Spring Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will propose research projects and conduct research activities. Students will perform presentation about their research progress, deepen the discussion and correct the course of the research. Students will perform presentation at academic meetings and publish the result of their research and finally complete a master thesis or a report on specific subject research.	Lectures are conducted in English. 主専攻必修科目。
01RC505	Master's Internship Abroad Spring	0	1.0	1, 2	Spring Semester	by request		真哉 高橋	Faculty from abroad associated with this program provide students with research topics in life sciences from basic to forefront. Students will acquire qualities of a researcher and the skills of presentation, discussion and communication by interacting with the lecturers.	Lectures are conducted in English.
01RC506	Life Science Innovation Master's Special Seminar II Fall	2	1.0	2	Fall Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will participate journal club in their laboratories, perform scientific presentation and discussion about the journal topics. Student will also take the obtained results into their own research.	Lectures are conducted in English. 主専攻必修科目。
01RC507	Life Science Innovation Master's Special Seminar II Spring	2	1.0	2	Spring Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will participate journal club in their laboratories, perform scientific presentation and discussion about the journal topics. Student will also take the obtained results into their own research.	Lectures are conducted in English. 主専攻必修科目。
01RC508	Life Science Innovation Master's Special Research II Fall	8	2.0	2	Fall Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will propose research projects and conduct research activities. Students will perform presentation about their research progress, deepen the discussion and correct the course of the research. Students will perform presentation at academic meetings and publish the result of their research and finally complete a master thesis or a report on specific subject research.	Lectures are conducted in English. 主専攻必修科目。
01RC509	Life Science Innovation Master's Special Research II Spring	8	2.0	2	Spring Semester	by request		ライフイノベーション学位プログラム博士前期課程研究指導教員	Students will propose research projects and conduct research activities. Students will perform presentation about their research progress, deepen the discussion and correct the course of the research. Students will perform presentation at academic meetings and publish the result of their research and finally complete a master thesis or a report on specific subject research.	Lectures are conducted in English. 主専攻必修科目。