Doctoral program for World-leading Innovative & Smart Education

The Frontier Development Program for Genome Editing

AY2023

Separate volume of the student handbook

Graduate School of Integrated Sciences for Life
Graduate School of Biomedical and Health Sciences
Hiroshima University

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1. Mission Statement & Learning Goals

The Frontier Development Program for Genome Editing is based on curricula led by world-class domestic and overseas genome editing researchers. We will develop the following human resources who can flexibly respond to changes in industry structure on new industries as well as changes in social trends for it.

① Developers of industrial genome editing technologies：We aim to nurture corporate researchers to acquire the know-how to effectively use genome editing technology.
Students will acquire the precision genetic modification methods, such as gene knock-in and single nucleotide modification, in addition to the method of applying genome editing technology to various species.

② Researchers of genome editing-based therapies and drug discovery：Genome editing is expected to be a new technology that can be directly linked to the treatment of diseases. We aim to nurture researchers who conduct translational research using cell production technology for disease treatment.

③ Developers of basic research in genome editing：We aim to nurture researchers who have the competitiveness and motivation to catch up with the development speed of overseas genome editing technology. Students will acquire not only the current genome editing technology, but also the skills to develop new technologies, such as gene modification and gene delivery.

④ Entrepreneurs of venture business related to genome editing：We aim to nurture researchers who have the mindset to plan value creation in new industrial fields, and link it to new startups based on the research results of genome-editing technology. To this end, we provide basic entrepreneurial skills training and practical training based on their own research topic in collaboration with some training programs in the university, such as the entrepreneurship education program and the seed discovery program for venture creation.

This program aims to train professionals who can take the lead in creating new industries in the field of biotechnology through these efforts.

2. Curriculum Policies

This program trains human resources who will contribute to the development of industrial technologies that will play a central role in the future industrial structure and lead to the creation of new industries contributing to economic development. Genome editing technology is expected to be used in a wide range of biotechnology industries from basics to applications, and there is an urgent need to train human resources who have mastered using this technology. Therefore, we will train researchers to freely edit the genomes of microorganisms and cultured cells, researchers to realize the creation of useful varieties, researchers to develop genome editing technologies in drug discovery, development and treatment, and researchers to develop basic technologies. In addition, we will train venture entrepreneurs who will develop genome editing technologies in Japan and overseas.

In this program, 12 specialized program subjects are offered to train the above-mentioned human resources while ratifying the curriculum policy of each degree program of the Graduate School. Students take courses and earn credits in accordance with the completion requirements of either Life Science Course of Medical Course.

The thesis research is carried out under the guidance of the primary advisor. The research topic, the guidance system, the research plan, the research progress, the interim presentation and the recording of the research results (Master's thesis) are voluntarily recorded and managed by the student in the learning portfolio, etc. with the confirmation of the primary and secondary advisors.

In Life Science Course, Qualifying Examination 1 (QE1) is taken in the second semester of the second year, Qualifying Examination 2 (QE2) as a Ph.D. candidate examination is taken in the second semester of the fourth year, and the final examination for the Ph.D. thesis is taken in the last year. In Medical Course, the Qualifying Examination (QE1) is taken in the second semester of the second year, the Qualifying Examination 2 (QE2) as a Ph.D. candidate examination is taken in the second semester of the third year, and the final examination for the doctoral dissertation is taken in the final year.

3. Diploma Policies

This program will award one of the following degrees to students who have acquired the knowledge, skills, and attitudes described below and who have passed the dissertation defense and final examination, while ratifying the degree policy of the program of the Graduate School to which they belong: Doctor of Philosophy in Engineering, Doctor of Philosophy in Agriculture, Doctor of Philosophy in Science, Doctor of Philosophy, Doctor of Philosophy in Medical Science, Doctor of Philosophy in Dental Science, or Doctor of Philosophy in Pharmaceutical Science.

Knowledge, skills, and attitudes to be acquired
(1) Basic knowledge of the principles of genome editing technology
(2) Knowledge and skills in genome editing through genome modification in microorganisms
(3) Knowledge and skills in genome editing for genetic modification in cultured cells
(4) Knowledge and skills in genome editing for genetic modification in animals and plants
(5) Ability to adapt to the rapid development of genome editing technology
(6) Knowledge and skills to assess the safety of genome editing
(7) Knowledge of the creation and management of intellectual property for genome editing
(8) Knowledge of social acceptance and ethics of genome editing
(9) High ethical standards for research in each area of expertise

・Doctor of Philosophy in Engineering
The Ph.D. degree in Engineering is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from an engineering perspective, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy in Agriculture
The Ph.D. degree in Agriculture is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from an agricultural perspective, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy in Science
The Ph.D. degree in Science is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from a perspective of life sciences, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy

The Ph.D. degree is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from an interdisciplinary perspective, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy in Medical Science

The Ph.D. degree in Medical Science is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from a perspective of medical sciences, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy in Dental Science

The Ph.D. degree in Dental Science is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from a perspective of dental sciences, and who have passed the dissertation defense and final examination.

・Doctor of Philosophy in Pharmaceutical Science

The Ph.D. degree in Pharmaceutical Science is awarded to the students who have acquired the above-mentioned knowledge, skills, and attitudes, and who have submitted a doctoral dissertation on the affiliated degree program of the Graduate School based on the research results mainly obtained from a perspective of pharmaceutical sciences, and who have passed the dissertation defense and final examination.

4. Academic Regulations of the Program

○Academic Regulations of the Frontier Development Program for Genome Editing

April 1, 2019

Approved by the general meeting of the Frontier Development Program for Genome Editing

Purpose of Regulations:

Article 1. These regulations shall stipulate the matters necessary for course requirements of the Frontier Development Program for Genome Editing in addition to what is stipulated in the Hiroshima University Graduate School Regulations (January 15, 2008 Regulation No.2) and the Regulations for the Hiroshima University Graduate School Program for World-leading Innovative & Smart Education (March 29, 2019 Regulation No. 30).

Objectives of Education and Research:

Article 2. The Frontier Development Program for Genome Editing aims to cultivate human resources that will contribute to the development of industrial technologies that will help create new industries that will play a central role in the future industrial structure and contribute to economic development.

Standard Period of Study:

Article 3. Standard period of study of Life Science Course is five years, and that of Medial Course is four years.

Special Course for third-year transfer students:

Article 4. (1) Life Science Course offers a special three-year course for the third-year transfer students.

(2) Standard period of study of above special course is three years.

Curriculum:

Article 5. The curricula of the Frontier Development Program for Genome Editing shall be as shown in Appendix 1 through Appendix 3.

Courses:

Article 6. (1) The courses and the number of credits to be taken in the Frontier Development Program for Genome Editing shall be as shown in Appendix 1 through Appendix 3.

(2) The class schedule shall be announced at the beginning of the academic year.

Standards for Calculating Credits:

Article 7. The calculation of the number of credits for each course shall be in accordance with the standards of the Graduate School, etc., offering the courses listed in the preceding article.

Methods of Course-Taking:

Article 8. (1) Students must complete the prescribed procedures for the courses they intend to take under the guidance of their primary advisor during the specified period each semester.

(2) A student who fails to follow the procedures prescribed in the preceding paragraph shall not

be admitted to the course. However, only in cases where it is recognized that there are special circumstances, the student may be permitted to take the course with the approval of the primary advisor and the instructor in charge of the course.

(3) For students other than those authorized by the Frontier Development Program for Genome Editing to attend the courses of the Frontier Development Program for Genome Editing, they must complete the prescribed procedures during the designated period of each semester.

Academic Advisors:

Article 9. (1) Students must submit the required "Academic Advisor Request Form" with the approval of the prospective academic advisors to the general meeting of the Frontier Development Program for Genome Editing (hereinafter referred to as "program general meeting") and also to the Graduate School to which the student belongs (hereinafter referred to as "affiliated Graduate School").

(2) The program general meeting shall appoint faculty advisors for each student as follows, based on the application prescribed in the preceding paragraph, in order to provide guidance in the student's coursework and the student's research.

[1] The primary advisor shall be a member of both the student's affiliated graduate program and the Frontier Development Program for Genome Editing.

[2] A student may have two or more secondary advisors.

[3] One of the secondary advisors shall be shall be a member of the Frontier Development Program for Genome Editing.

[4] One of the secondary advisors shall be appointed from a program other than the student's affiliated graduate program and may also be appointed from another Graduate School or university.

[5] In cases where one of the secondary advisors simultaneously meets the requirements of the previous two items, a faculty member other than those specified in the previous two items may be appointed as the secondary advisor.

[6] Other than the above items, students must follow the bylaws of the affiliated Graduate School.

(3) To change academic advisors, the student must submit the "Request for Change of Academic Advisor" to the program general meeting with the approval of the academic advisors and must be approved at the meeting.

Qualifying Examinations 1:

Article 10. (1) Students who meet the criteria specified in Article 11 below may take the Qualifying Examination 1 (QE1) specified in the following items. Students who pass the QE1 shall continue to the third year of the Frontier Development Program for Genome Editing.

(2) The examination consists of three components: a written exam on course work, an oral exam on research work, learning outcomes recorded in an e-learning portfolio.

Eligibility for Qualifying Examination 1:

Article 11. (1) The eligibility requirements for the QE for the five-year course are as follows.

[1] Students must have earned (or will have earned) the required number of credits in the master's program of the affiliated Graduate School and be expected to complete the master's program.

[2] Students must have earned (or will have earned) 29 credits or more by the end of the second year in a five-year course.

(2) The eligibility requirements for the QE for the four-year course are as follows.

[1] Students must have earned (or will have earned) the required number of credits by the end of the second year of the affiliated Graduate School.

[2] Students must have earned (or will have earned) 20 credits or more at the end of the second year in a four-year course.

Qualifying Examinations 2:

Article 12. (1) Students who are recognized by the program director as having earned (or will have earned) the required number of credits for completion of both the affiliated Graduate School and the course of the Frontier Development Program for Genome Editing are eligible to take the PhD Candidacy Examination (the Qualifying Examination 2: QE2) as specified in the respective sections below.

(2) The examination consists of two components: an oral exam of the PhD thesis proposal, learning outcomes recorded in the e-learning portfolio.

(3) As a rule, students take the QE2 in the fourth year of the five-year course or in the third year of the four-year course.

Requirements for the completion of a five-year course:

Article 13. The requirements for the completion of a five-year course are: a) Passing the QE2, b) Earning 53 credits or more from the courses specified in the separate Table 1, c) Earning the required number of credits for the completion of both the Master's program and the Doctoral program at the affiliated Graduate School, d) Publishing an English article in a peer-reviewed academic journal, e) Presenting a research result at an international conference, f) Submitting a doctoral thesis under the guidance of the academic supervisor and passing the thesis defense and the final examination.

However, the degree may also be granted to those who have achieved outstanding research results in less than five years, with the approval of the program general meeting and the Faculty Council of the affiliated Graduate School. In this case, the minimum period of enrollment is four years.

Requirements for the completion of a special three-year course:

Article 14. The requirements for the completion of a three-year course are: a) Passing the QE2, b) Earning 32 credits or more from the courses specified in the separate Table 2, c) Earning the required number of credits for completion of Doctoral program at the affiliated Graduate School, d) Publishing an English article in a peer-reviewed academic journal, e) Presenting a research

result at an international conference, f) Submitting a doctoral thesis under the guidance of the academic supervisor and passing the thesis defense and the final examination.

However, the degree may also be granted to those who have achieved outstanding research results in less than three years, with the approval of the program general meeting and the Faculty Council of the affiliated Graduate School. In this case, the minimum period of enrollment is two years.

Requirements for the completion of a four- year course:

Article 15. The requirements for the completion of a four-year course are: a) Passing the QE2, b) Earning 45 credits or more from the courses specified in the separate Table 3, c) Earning the required number of credits for the completion of Doctoral program at the affiliated Graduate School, d) Publishing an English article in a peer-reviewed academic journal, e) Submitting a doctoral thesis under the guidance of the academic supervisor and passing the thesis defense and the final examination.

However, the degree may also be granted to those who have achieved outstanding research results in less than four years, with the approval of the program general meeting and the Faculty Council of the affiliated Graduate School. In this case, the minimum period of enrollment is three years.

Miscellaneous Regulations;

Article 16. In addition to the matters set forth in these regulations, any necessary matters for course requirements of the Frontier Development Program for Genome Editing shall be stipulated separately.

Supplementary Provisions

These regulations shall come into effect as of April 1, 2019.

Supplementary Provisions (Partial revision made on March 5, 2020)

1. These regulations shall come into effect as of April 1, 2020.
2. With regard to persons who enrolled in the program in 2020AY, the provisions in force then shall remain applicable.

Supplementary Provisions (Partial revision made on February 14, 2022)

1. These regulations shall come into effect as of April 1, 2022
2. With regard to persons who enrolled in the program in or before 2021AY, the provisions in force then shall remain applicable. When deemed educationally beneficial, the Frontier Development Program for Genome Editing may allow students to register the course stipulated in the revised regulation.
3. In the case of the proviso of the preceding paragraph, the Frontier Development Program for Genome Editing shall grant credits as specified by the program.

Appended Table 1 (Related to Article 6,7, and 13)

【Life Science Course】

Course Category		Course	Credits	Required No. of credits		Year taken	Department in charge
				Required	Required elective		
Common Graduate Courses		Data Literacy	1		1	1・2	Headquarters for Educati
		Career Management for Engineer	2				
		Select a course from Sustainable Development Courses in Common Graduate Courses (Doctoral Course)			1	3・4・5	
		Data Science	2		2	3・4・5	
		Pathway to Becoming a Data Scientist	1				
		Career Management for Highly Skilled Innovators	1				
Specialized Courses of the Frontier Development Program for Genome Editing		Ethics of Genome Editing Research	1	1		1・2	Graduate School of Integrated Sciences for Life
		Basics and Practical Applications of Genome Editing	2	2			
		Bioinformatics	2	2			
		Introduction to Genetics and Genomics	2	2			
		Clinical Applications of Genome Editing Technology	1	1			
		Basic Training of Genome Editing	2	2			
		Science and Technology in Society	1	1		2	
		Trends of Genome Editing in Life Science	2		2	3・4・5	
		Trends of Genome Editing in Medical Science	2				
		Internship at CiRA	2		2	4	
		Internship at Cutting-edge Genome Editing Laboratories	2				
		Internship at Collaborative Research Companies	2				
Graduate School of Integrated Sciences for Life	Common Courses in Graduate School	Special Lectures in Integrated Sciences for Life*	2		6	1	Graduate School of Integrated Sciences for Life
		Research Methods in Life Science*	2				
		English Presentation Methods in Science and Technology	2			2	
		Societal Implementation of Life Science	2			1	
		Lecture on Developing Communication Skill	2				
		Science Seminar A	2			1・2	
		Research Plans in Life Science	2		4	3	Graduate School of Integrated Sciences for Life
		Career Development for Life Science	2			3	
		Science Seminar B	2			3・4・5	
	Specialized Courses in Program	Advanced Seminars in the Specialized Courses in the affiliated degree program		8		1	Graduate School of Integrated Sciences for Life
		Research Courses in the affiliated degree program*	4	4		1～2	
		Research for Academic Degree Dissertation in Integrated Life Sciences*	12	12		3～5	
Total required credits				35	18	Total 53 credits	

The asterisk (*) represents 'required course' in the Graduate School of Integrated Sciences for Life

Completion Requirements

Ⅰ Acquisition of at least 53 credits as specified below;

1 Required

- Specialized Courses of the Frontier Development Program for Genome Editing 11 credits
- Specialized Courses in Program in the Graduate School of Integrated Sciences for Life 24 credits (including 'Research for Academic Degree Dissertation')

2 Required Elective

- Common Graduate Courses 4 credits or more
- Specialized Course for the Frontier Development Program for Genome Editing 4 credits or more
- Common Courses in the Graduate School of Integrated Sciences for Life 10 credits or more

Ⅱ Fulfillment of requirements for the degrees in the affiliated graduate school (both master's course and doctoral course) .

NOTE : In case of overlapping courses, credits earned for the degrees in the graduate school will count towards the credits required for the Life Science Course completion.

Appended Table 2 (Related to Article 6,7, and 14)

【Life Science Course (3-year curriculum)】

Course Category	Course	Credits	Required No. of credits		Year taken	Department in charge
			Required	Required elective		
Common Graduate Courses	Select a course from Sustainable Development Courses in Common Graduate Courses (Doctoral Course)			1	3・4・5	Headquarters for Education
	Data Science	2		2	3・4・5	
	Pathway to becoming a Data Scientist	1				
	Career Management for Highly Skilled Innovators	1				
Specialized Courses of the Frontier Development Program for Genome Editing	Ethics of Genome Editing Research	1	1		3	Graduate School of Integrated Sciences for Life
	Basic Training of Genome Editing	2	2		3	
	Science and Technology in Society	1	1		4	
	Basics and Practical Applications of Genome Editing	2		5	3・4・5	
	Bioinformatics	2				
	Introduction to Genetics and Genomics	2				
	Clinical Applications of Genome Editing Technology	1				
	Trends of Genome Editing in Life Science	2		2		
	Trends of Genome Editing in Medical Science	2				
	Internship at CiRA	2		2	4	
	Internship at Cutting-edge Genome Editing Laboratories	2			4	
	Internship at Collaborative Research Companies	2			4	
Graduate School of Integrated Sciences for Life / Common Courses in Graduate School	Research Plans in Life Science	2		4	3・4・5	Graduate School of Integrated Sciences for Life
	Career Development for Life Science	2				
	Science Seminar B	2				
Graduate School of Integrated Sciences for Life / Specialized Courses in Program	Research for Academic Degree Dissertation in Integrated Life Sciences*	12	12		3～5	
Total required credits			16	16	Total 32 credits	

The asterisk(*) represents 'required course' in the Graduate School of Integrated Sciences for Life

Completion Requirements

Ⅰ Acquisition of at least 32 credits as specified below;

1 Required

・Specialized Courses of the Frontier Development Program for Genome Editing 4 credits

・Specialized Courses in Program in the Graduate School of Integrated Sciences for Life 12 credits
('Research for Academic Degree Dissertation')

2 Required Elective

・Common Graduate Courses 3 credits or more

・Specialized Course for the Frontier Development Program for Genome Editing 9 credits or more

・Common Courses in the Graduate School of Integrated Sciences for Life 4 credits

Ⅱ Fulfillment of requirements for the degrees in the affiliated graduate school (doctoral course) .

NOTE : In case of overlapping courses, credits earned for the degrees in the graduate school will count towards the credits required for the Life Science Course (3-year curriculum) completion.

Bylaws for the Completion of the Frontier Development Program for Genome Editing, Appended Table 3 (Related to Article 6,7, and 15)
【Medical Course】

Course Category		Course	Credits	Required No. of credits		Year taken	Department in charge
				Required	Required elective		
Common Graduate Courses		Select a course from Sustainable Development Courses in Common Graduate Courses (Doctoral Course)			1	1・2・3	Headquarters for Education
		Data Science	2		1	1・2・3	
		Pathway to becoming a Data Scientist	1				
		Career Management for Highly Skilled Innovators	1				
Specialized Courses of the Frontier Development Program for Genome Editing		Ethics of Genome Editing Research	1	1		1・2	Graduate School of Integrated Sciences for Life
		Basics and Practical Applications of Genome Editing	2	2			
		Bioinformatics	2	2			
		Introduction to Genetics and Genomics	2	2			
		Clinical Applications of Genome Editing Technology	1	1			
		Basic Training of Genome Editing	2	2			
		Science and Technology in Society	1	1		2	
		Trends of Genome Editing in Life Science	2		2	3・4	
		Trends of Genome Editing in Medical Science	2				
		Internship at CiRA	2		2		
		Internship at Cutting-edge Genome Editing Laboratories	2				
		Internship at Collaborative Research Companies	2				
Graduate School of Biomedical and Health Sciences	Common Courses	Medical Ethics B	1		4	1	Graduate School of Biomedical and Health Sciences
		Methods in Biomedical Sciences B	1			1	
		Advanced Coursework of Biomedical Sciences	1			1	
		Creation and Development of Biomedical Sciences	1			1	
		Lecture on Biodesign B1	1			1	
		Lecture on Biodesign B2	1			1	
		Lecture on Translational Research B	1			1	
		Multidisciplinary Cooperation B	1			1	
	Common Courses in Division	Principles of Oncology	1		2	1	Graduate School of Biomedical and Health Sciences
		Integrated Radiation Medical Science	1			1	
		Pharmacotherapeutic Research	1			1	
		Practice of Oncology	1			1	
		Cause of Death Investigation	1			1	
	Specialized Courses in Program	Advanced Seminars in the Specialized Courses in the affiliated degree program			10	1	Graduate School of Biomedical and Health Sciences
		Research Courses in the affiliated degree program		12		1～3	
Total required credits				23	22	Total 45 credits	

Completion Requirements

Ⅰ Acquisition of at least 45 credits as specified below;

1 Required

・Specialized Courses for the Frontier Development Program for Genome Editing 11 credits

・Specialized Courses in Program in the Graduate School of Integrated Sciences for Life (Research Courses) 12 credits

2 Required Elective

・Specialized Courses for the Frontier Development Program for Genome Editing 4 credits or more

・Common Graduate Courses 2 credits or more

・Common Courses in the Graduate School of Biomedical and Health Sciences 4 credits or more

・Common Courses in Division of the Graduate School of Biomedical and Health Sciences 2 credits or more

・Specialized Courses in Program of the Graduate School of Biomedical and Health Sciences 10 credits or more

Ⅱ Fulfillment of requirements for the degrees in the affiliated graduate school

NOTE : In case of overlapping courses, credits earned for the degrees in the graduate school will count towards the credits required for the Medical Course completion.

5. Curriculum Overview

1) Life Science Course of the Frontier Development Program for Genome Editing (D1-D5)

A student is required to earn the credits necessary to complete and fulfill the requirements of his or her degree program in the Graduate School of Integrated Sciences for Life and the Life Science Course simultaneously.

A Master's program, M1 and M2 of the Graduate School is equivalent to D1 and D2, and a Doctoral program, from D1 to D3 of the Graduate School is equivalent to D3, D4, and D5 of the Life Science Course.

A student is not required to write a master's thesis, but must pass the Qualifying Examination 1 (QE1) in the second semester of D2, the Qualifying Examination 2 (QE2) as a doctoral candidate examination in the second semester of D4, and the Final Examination for Doctoral Dissertation in the final year, D5.

Please fulfill the completion requirement for the Life Science Course with the following in mind.

<Important Notes>

1. Up to 6 credits from the Specialized Courses offered by other programs in the affiliated Graduate School/ other Graduate Schools (cognate courses) may include the credits earned from the Specialized Course for the Frontier Development Program for Genome Editing (*Not applicable to the Program of Biomedical Science).
2. The credits from 'Research for Academic Degree Dissertation' in the Master's program and 'Research for Academic Degree Dissertation in Integrated Life Sciences' in the Doctoral program of the Graduate School will count toward the credits required for course completion as one of the designated courses of the Frontier Development Program for Genome Editing.
3. For course registration, please refer to the course list of each program in this handbook. Only courses designated by the Frontier Development Program for Genome Editing are listed for "Required Electives" and "Specialized Courses in Program" on each program list.

2) Life Science Course of the Frontier Development Program for Genome Editing (D3-D5)

***3-year curriculum**

A transfer student is required to earn the credits required for completion and satisfy the requirements of both his/her degree program in the Graduate School of Integrated Sciences for Life to which he/she belongs and the Life Science Course simultaneously.

A Master's program, M1 and M2 of the Graduate School is equivalent to D1 and D2, and a Doctoral program, from D1 to D3 of the Graduate School is equivalent to D3, D4, and D5 of the Life Science Course.

A student must pass the Qualifying Examination 2 (QE2) as a doctoral candidate examination in the second semester of D4, and Final Examination for Doctoral Dissertation in the final year, D5.

Please fulfill the completion requirement for the Life Science Course (3-year curriculum) with the

following points in mind.

<Important Notes>

1. The credits from ‘Research for Academic Degree Dissertation in Integrated Life Sciences’ in the Doctoral program of the Graduate School will count toward the credits required for course completion as one of the designated courses of the Frontier Development Program for Genome Editing.
2. For course registration, please refer to the course list of each program in this handbook. Only courses designated by the Frontier Development Program for Genome Editing are listed for "Required Electives" on each program list.

3) Medical Course of the Frontier Development Program for Genome Editing (D1-D4)

A student is required to earn the credits required for completion and satisfy the requirements of both his/her degree program in the Graduate School of Biomedical and Health Sciences to which he/she belongs and the Medical Course simultaneously.

A student must pass the Qualifying Examination 1 (QE1) in the second semester of D2, Qualifying Examination 2 (QE2) as a doctoral candidate examination in the second semester of D3, and Final Examination for Doctoral Dissertation in the final year, D4.

Please fulfill the completion requirement for the Medical Course with the following points in mind.

<Important Notes>

1. The credits from the “research courses offered by the primary advisor” in the Graduate School of Biomedical and Health Sciences will count toward the credits required for course completion as one of the designated courses of the Frontier Development Program for Genome Editing.
2. For course registration, please refer to the course list of each program in this handbook.

4) Credit Approval of the Internship Program

(Internship Objectives)

In order for students to be aware of the linkage between their specialized research and the real world as well as to become researchers or highly skilled professionals who are capable of building a more sustainable society, it is important for them to understand how specialized research in biology and life sciences is developed for social implementation in the real world. Students will carry out an internship at academic institutions and companies in Japan and abroad to understand the way a research is conducted as a job, to improve their communication skills through discussions with people there, and to cultivate their social skills as professionals. In particular, this program offers overseas advanced laboratory training and practical education

for collaborative research through advanced practice at partner companies and institutions to enable students to experience practical application research and learn about the situation of the cutting-edge research and development at research sites.

Students are required to submit following documents before and after their internship.

Forms/ Documents to be submitted:

[Before Internship]

a) Internship Plan Report and Travel Grant Application Form

b) Internship Pledge

[After Internship]

c) Credit Approval Application Form

d) Internship Final Report

e) Intern Evaluation Form (completed by the host organization)

f) Other relevant documents

Internship Process:

1. Decision of the host organization/institution: A host organization of internship is decided in discussion with the student's primary advisor, and the student is advised to understand internship rules and conditions provided by the host organization prior to the internship program.
2. Submission of abovementioned documents two or three months in advance.
3. After approval by the Program, carrying out an internship based on the Internship Plan.
4. (After the internship) Submission of abovementioned documents.
5. Evaluation of performance based on the submitted forms and reports.

6. Course List of each Degree Program

（Course List of your degree program will be provided separately.）

7. Qualifying Examination 1 (QE1)

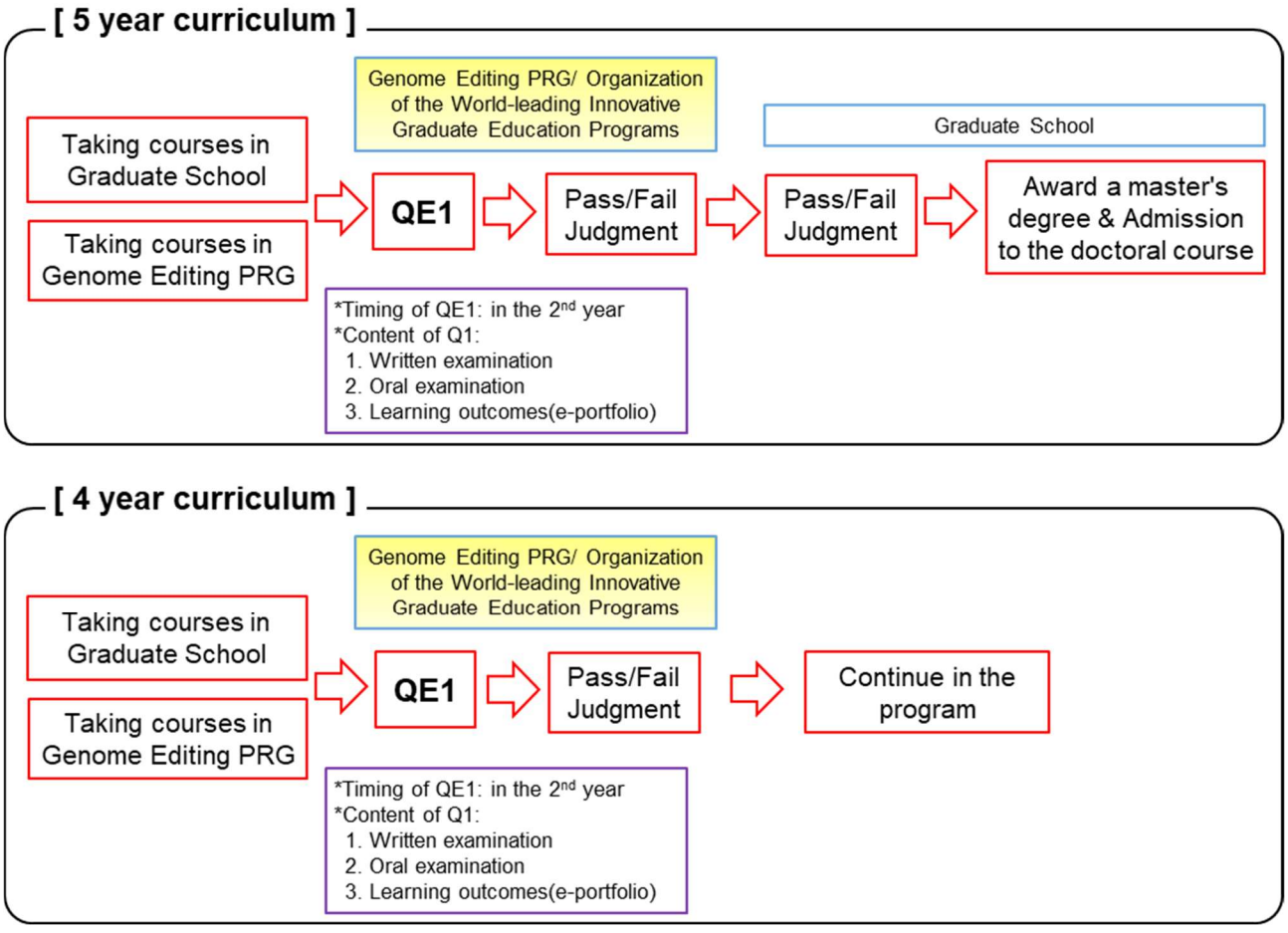
1) Overview

QE1 shall be carried out in the second year of both the Life Science Course and the Medical Course of the Frontier Development Program for Genome Editing. (*Students of Life Science Course are not required to write a master's thesis.)

In order to take the examination, students in the Life Science Course are expected to complete the course requirements of both their affiliated Graduate School (master's program) and D1 and D2 of the Genome Editing Program, and students in the Medical Course are expected to earn the required number of credits for D1 and D2 of the Genome Editing Program.

Students must submit (a) an application form, (b) a research achievement report, and (c) a dissertation proposal to take QE1. QE1 consists of a written examination and an oral examination: the written examination on the knowledge acquired in the Graduate School and the specialized courses of the Genome Editing Program, the oral examination on the research achievements, and the dissertation proposal. The final grade (pass/fail) will be based on an overall assessment.

2) Flow Chart



The Frontier Development Program for Genome Editing, Hiroshima University
Application for Qualifying Examination 1 in AY 20XX

YYYY/MM/DD

To the Director of the Frontier Development Program for Genome Editing

Course:

Student ID Number:

Student Name:

I hereby apply for Qualifying Examination 1 of the Frontier Development Program for Genome Editing.
The eligibility requirements for taking this examination [have been fulfilled / will have been fulfilled]
as follows:

Graduate School・Degree Program					
Required Credits	credits	Earned Credits	credits	Prospective Credits	credits

Course	XXX Course the Frontier Development Program for Genome Editing				
Required Credits	credits	Earned Credits	credits	Prospective Credits	credits

Primary
Academic Advisor:

【Submission procedure】
① Fill in the number of acquired (prospective) credits, and receive the approval of your primary advisor.
② Submit this form to the office.

8. Qualifying Examination 2 (QE2)

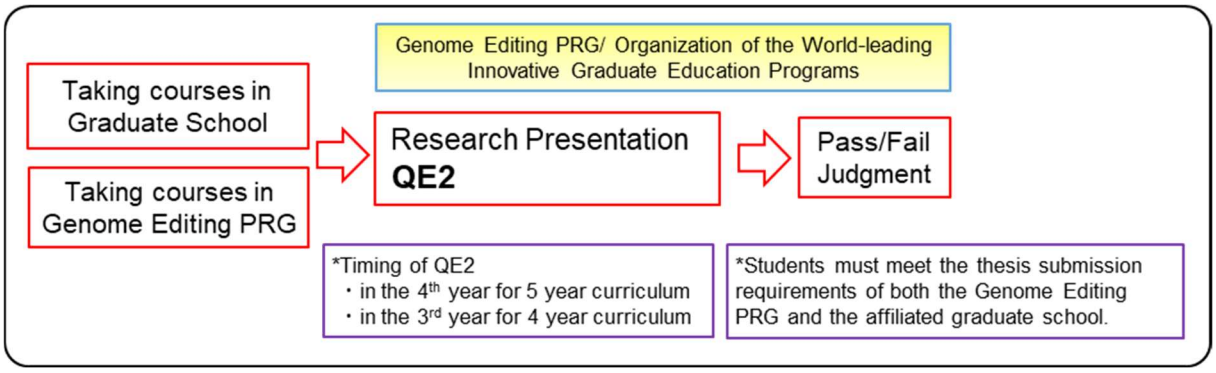
1) Overview

QE2 shall be carried out in the fourth year of the Life Science Course and in the third year of the Medical Course of the Frontier Development Program for Genome Editing.

Students are expected to complete the course requirements for both the affiliated Graduate School (Doctoral program) and Genome Editing program in order to take the examination.

Students must also submit an application form and a dissertation abstract written in English. In QE2, the oral examination on the outline of a dissertation will be conducted and the learning outcomes recorded in the e-portfolio will be confirmed.

2) Flow chart



The Frontier Development Program for Genome Editing, Hiroshima University
Application for Qualifying Examination 2 in AY 20XX

YYYY/MM/DD

To the Director of the Frontier Development Program for Genome Editing

Student ID Number:

Student Name:

Primary Advisor:

I hereby apply for Qualifying Examination 2 of the Frontier Development Program for Genome Editing.

【Submission procedure】

Submit this form to the Office after receiving the approval of your primary advisor.

9. Doctoral Dissertation and Final Examination (FE)

The Frontier Development Program for Genome Editing allows students who have passed QE2 to apply for degree conferral by submitting a doctoral dissertation.
The application requirements for degree conferral are as follows:

1) Applicants must meet the application requirements for the PhD degree in the affiliated Graduate School.
2) Applicants must meet the credit requirements for completion of the affiliated course in the Frontier Development Program for Genome Editing.
3) Applicants must have published or scheduled to publish at least one paper in English in a peer-reviewed journal.
4) Applicants must have given a research presentation at an international academic conference (Life Science Course only).
5) Applicants must have received appropriate research guidance.

Preliminary and final screening for doctoral dissertations are basically performed in accordance with the By-Laws of the Graduate School on Hiroshima University Degree Regulations. Please refer to the Student Handbook of the Graduate School.

10. Academic and Financial Support Information

1) Notification

Notifications from the University will be sent to the student by e-mail or posted on 'Momiji': the portal site for Hiroshima University students. Please check both daily to make sure you don't miss any important announcements.

2) Changes in Student Status (Leave of Absence, Withdrawal, Name Change, etc.)

Please be sure to contact the Collaboration Office (leading-program@office.hiroshima-u.ac.jp) when you have submitted the documents to the Graduate School to change your student status, or if you have any questions or concerns regarding the Genome Editing Program.

3) Scholarship

Students in the Genome Editing Program are eligible to apply for the “Hiroshima University Doctoral program for World-leading Innovative & Smart Education Scholarship”.

Up to three students will be selected each semester and will receive 50,000 yen per month. In order to apply for this scholarship, students must have outstanding academic performance and achievements while enrolled in the program. Details will be announced separately.

4) Tuition Waiver

Doctoral students in the Genome Editing Program who have outstanding academic performance are eligible for the “Tuition Waivers for the Hiroshima University Doctoral Program for World-leading Innovative & Smart Education.” Students will be screened each semester based on their grades and will receive a full tuition waiver. The screening result will be notified to them around March and September.

5) Academic Travel Grant

Students in the Genome Editing Program are eligible to apply for an Academic Travel Grant for the purpose of the following academic activities:

Successful applicants may receive a grant (transportation and accommodation expenses) up to the amount specified by the program. Please contact the Collaboration Office for details.

a) Student-led research activities at overseas universities or institutions, etc.
b) Student-led collaborative research activities
c) Student presentations at conferences and meetings in fields related to the Genome Editing Program education or research
d) Additional activities deemed necessary by the Genome Editing Program

6) Mentoring Program

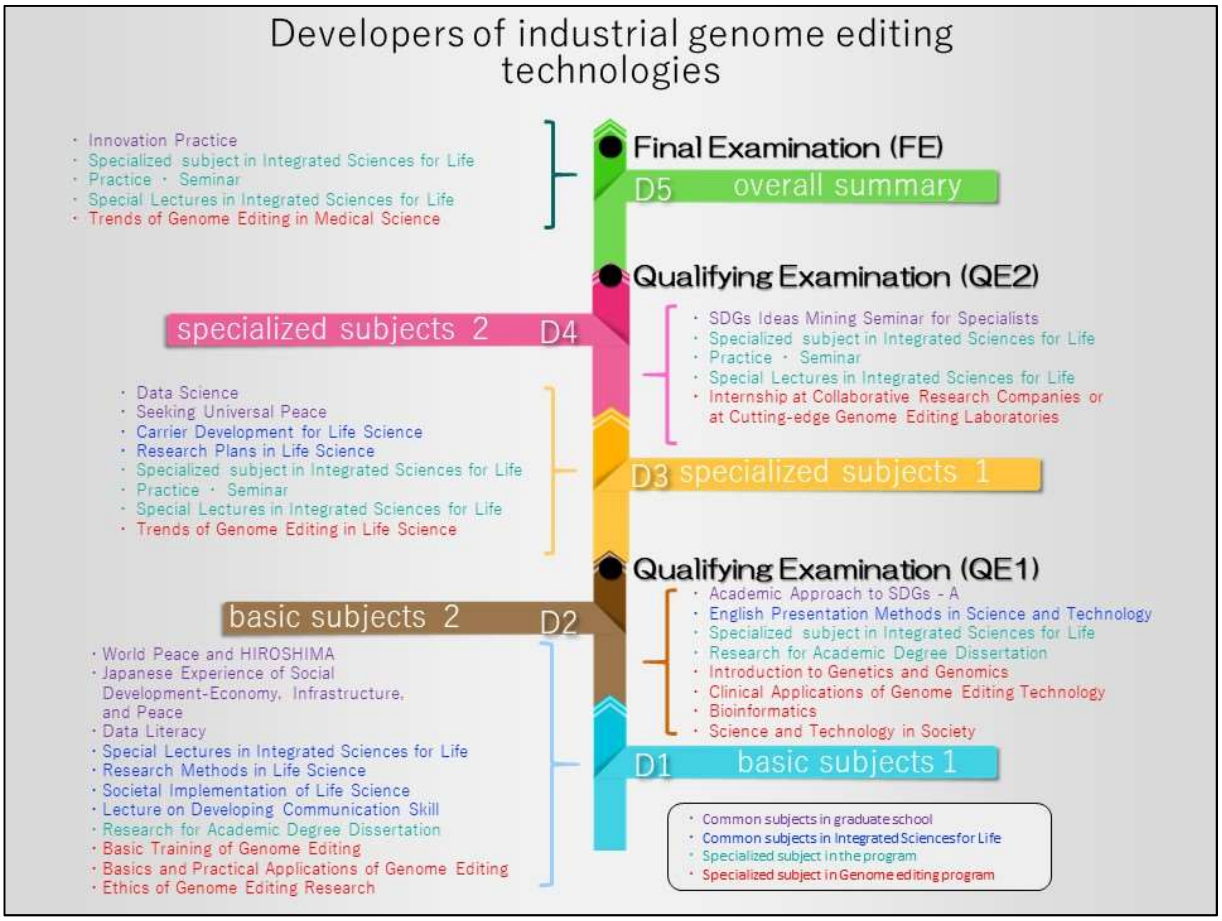
Associate professors, lecturers, assistant professors of the Genome Editing Program provide valuable support to students as "mentors". Program students can contact them directly for academic advice. Details will be provided separately.

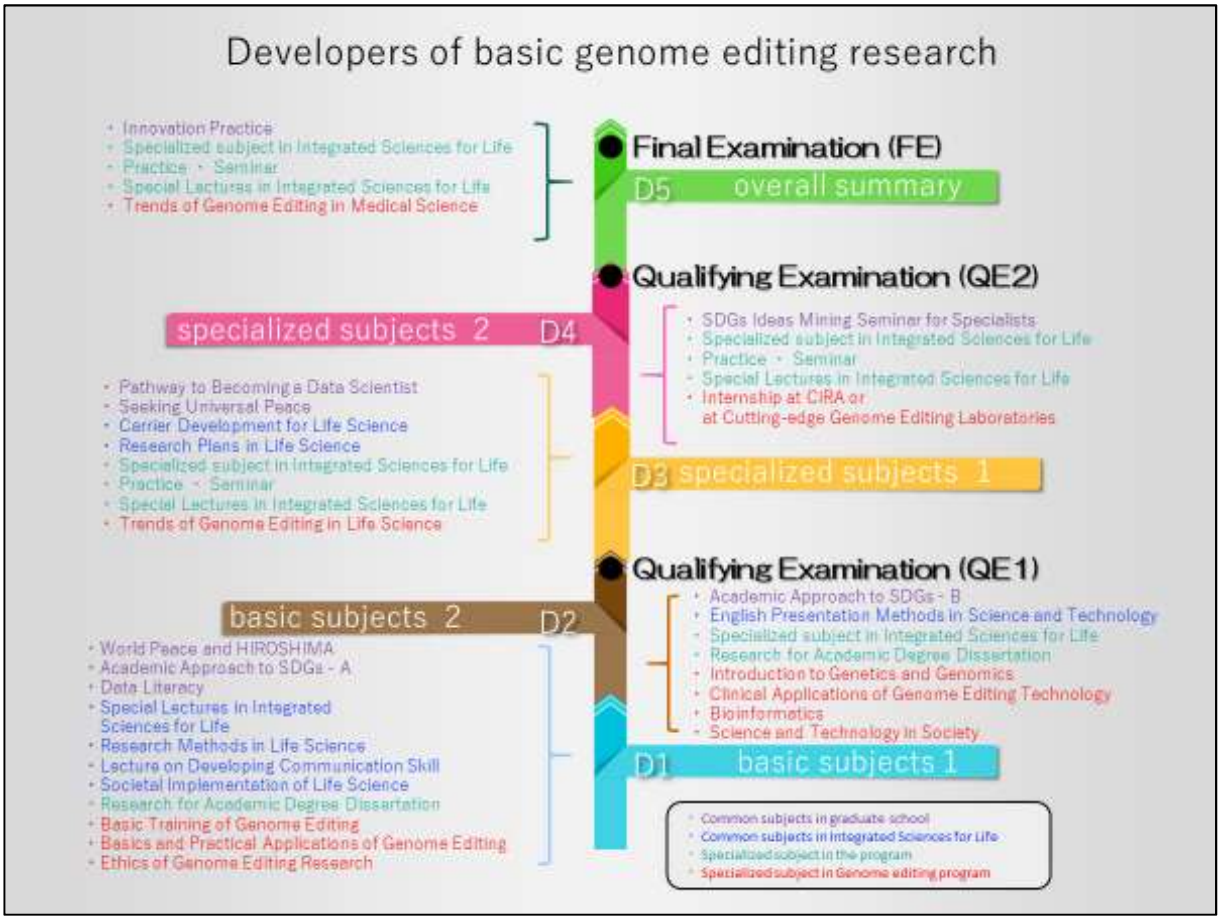
7) Career Survey

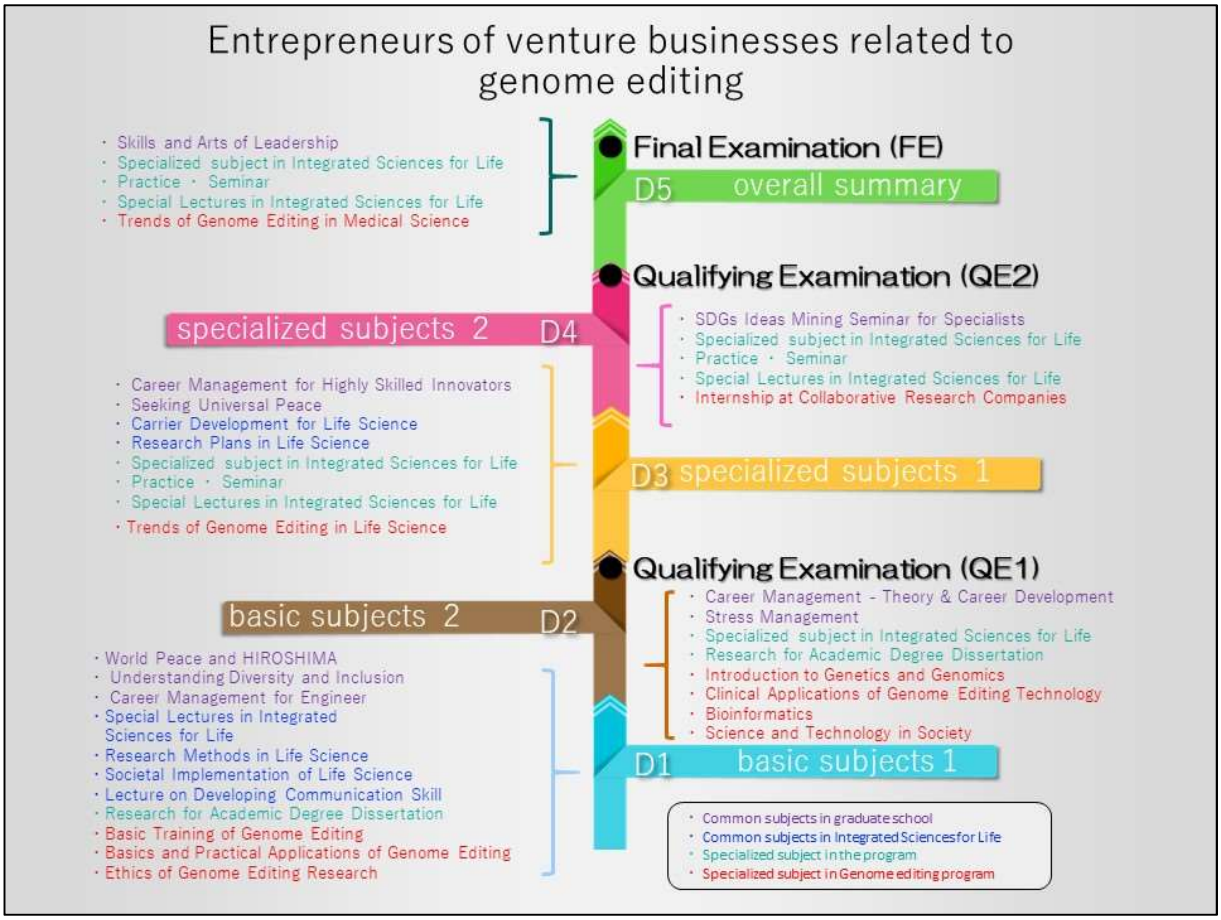
Alumni may be asked to participate in a career survey upon completion of the program. Please provide the Collaboration Office (leading-program@office.hiroshima-u.ac.jp) with an email address where you can be reached.

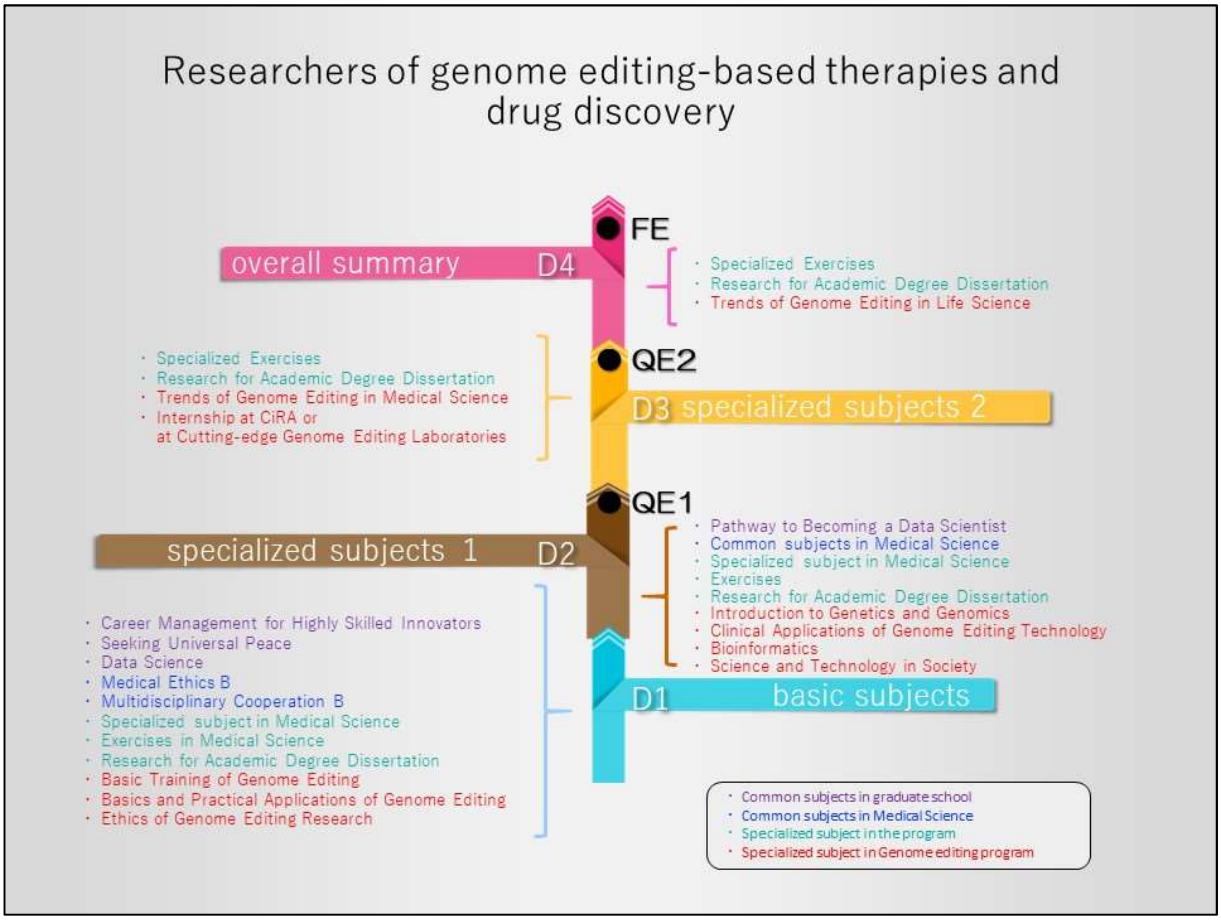
*Please note that the above 3) to 6) are subject to change or elimination due to University policy.

11. Role Models






Entrepreneurs of venture businesses related to genome editing
・Skills and Arts of Leadership
・Specialized subject in Integrated Sciences for Life
・Practice ・ Seminar
・Special Lectures in Integrated Sciences for Life
・Trends of Genome Editing in Medical Science
Final Examination (FE)
D5 overall summary
Qualifying Examination (QE2)
specialized subjects 2 D4
・SDGs Ideas Mining Seminar for Specialists
・Specialized subject in Integrated Sciences for Life
・Practice ・ Seminar
・Special Lectures in Integrated Sciences for Life
・Internship at Collaborative Research Companies
・Career Management for Highly Skilled Innovators
・Seeking Universal Peace
・Carrier Development for Life Science
・Research Plans in Life Science
・Specialized subject in Integrated Sciences for Life
・Practice ・ Seminar
・Special Lectures in Integrated Sciences for Life
・Trends of Genome Editing in Life Science
D3 specialized subjects 1
Qualifying Examination (QE1)
・Career Management - Theory & Career Development
・Stress Management
・Specialized subject in Integrated Sciences for Life
・Research for Academic Degree Dissertation
・Introduction to Genetics and Genomics
・Clinical Applications of Genome Editing Technology
・Bioinformatics
・Science and Technology in Society
basic subjects 2 D2
・World Peace and HIROSHIMA
・Understanding Diversity and Inclusion
・Career Management for Engineer
・Special Lectures in Integrated Sciences for Life
・Research Methods in Life Science
・Societal Implementation of Life Science
・Lecture on Developing Communication Skill
・Research for Academic Degree Dissertation
・Basic Training of Genome Editing
・Basics and Practical Applications of Genome Editing
・Ethics of Genome Editing Research
D1 basic subjects 1
・Common subjects in graduate school
・Common subjects in Integrated Sciences for Life
・Specialized subject in the program
・Specialized subject in Genome editing program


Researchers of genome editing-based therapies and drug discovery
FE
overall summary D4
・Specialized Exercises
・Research for Academic Degree Dissertation
・Trends of Genome Editing in Life Science
・Specialized Exercises
・Research for Academic Degree Dissertation
・Trends of Genome Editing in Medical Science
・Internship at CiRA or at Cutting-edge Genome Editing Laboratories
QE2
D3 specialized subjects 2
QE1
・Pathway to Becoming a Data Scientist
・Common subjects in Medical Science
・Specialized subject in Medical Science
・Exercises
・Research for Academic Degree Dissertation
・Introduction to Genetics and Genomics
・Clinical Applications of Genome Editing Technology
・Bioinformatics
・Science and Technology in Society
specialized subjects 1 D2
・Career Management for Highly Skilled Innovators
・Seeking Universal Peace
・Data Science
・Medical Ethics B
・Multidisciplinary Cooperation B
・Specialized subject in Medical Science
・Exercises in Medical Science
・Research for Academic Degree Dissertation
・Basic Training of Genome Editing
・Basics and Practical Applications of Genome Editing
・Ethics of Genome Editing Research
D1 basic subjects
・Common subjects in graduate school
・Common subjects in Medical Science
・Specialized subject in the program
・Specialized subject in Genome editing program