Graduate Major in Life Science and Technology

The School of Life Science and Technology nurture students who will be able to contribute to the creation of universal intellectual basis and give it back to the society with an ethical worldview through elucidation of biological mechanisms and through pioneering new engineering applications based on the biological knowledge.

[Master's Degree Program]

1. Outline

By acquiring advanced expertise in the field of "Life Science and Technology", students obtain problem-setting and problem-solving skills contributing to the development of "Life Science and Technology" as well as high ethical standard, which will make them internationally successful science and engineering professionals.

2. Competencies Developed

To achieve the above objectives, this program supports students to acquire the following skills.

- Advanced expertise in "Life Science and Technology"
- Advanced problem-setting and problem-solving skills underpinned by expertise and an ethical worldview
- Advanced sophistication and communicating skills required as international professionals

3. Learning Goals

To acquire the skills listed in "Competencies Developed", students in this program will have the following trainings.

A) Acquiring advanced expertise in the field of "Life Science and Technology"
Acquiring advanced expertise in the research field of "Life Science and Technology" through Research Seminars, Research-Related Courses, and Major Courses

B) Acquiring the knowledge of a broad range of science and technology fields
Learning broad knowledge conducive to the development of science and technology through abundant Major Courses

C) Acquiring research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity
Acquiring research-executing, problem-setting, problem-solving, and academic writing skills as well as innovative creativity through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

D) Acquiring international communication skills
Learning advanced communication skills required as international professionals through Humanities and Social Science Courses, Career Development Courses, and Major Courses

E) Cultivating sophistication in relation to bioethics and society
Learning ethical and social values relevant to life and research in "Life Science and Technology" through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses

4. IGP Completion Requirements

Table M1 shows the course classification for this major, and the number of credits needed to complete the Master's Degree Program. The required number of credits is indicated by course category and by course group. The column on the right shows the learning goals related to the courses. Students should have a good understanding of the relationship between the course and the learning goals when signing up for the course.

The following requirements must be met to complete the Master's Degree Program of this major.

1. A total of 30 credits or more acquired from 400- and 500-level courses.
2. From the courses specified in the Graduate Major in Life Science and Technology curriculum,
    - 8 credits acquired from Research Seminars;
    - 4 credits acquired from Research-Related Courses;
    - a minimum of 8 credits acquired from Major Courses;
    - IGP (C) students are required to acquire Directed Collaboration Works (2 credits);
    - a minimum of 5 credits acquired from Liberal Arts and Basic Science Courses
      (3 credits from Humanities and Social Science Courses of which 2 credits must be from 400-level courses and 1 credit from 500-level courses, and 2 credits from Career Development Courses).
3. Pass the master's thesis review and defense.

Table M1. Graduate Major in Life Science and Technology Completion Requirements

Course category		<Required courses> Required credits	<Electives> Minimum credits required	Minimum credits required	Associated learning goals	Comments
Liberal Arts and Basic Science Courses	**Humanities and Social Science Courses**		・2 credits from 400 level ・1 credit from 500 level	5 credits	D,E	
	Career Development Courses		2 credits		D,E	
	Other Courses					
Core Courses	**Research Seminars**	LST Seminar S1 LST Seminar F1 LST Seminar S2 LST Seminar F2 A total of 8 credits, 2 credit each from the above courses.		20 credits from Core Courses of the Graduate Major standard curriculum	A,C	
	Research-Related Courses	MS Qualifying Presentation 1 (1 credit) MS Qualifying Presentation 2 (1 credit) LST Directed Laboratory Work (2 credits) A total of 4 credits			A,C	
	Major Courses	Directed Collaboration Works (2 credits)	6 credits		A,B,C,D,E	
	Major Courses and Research-Related Courses <u>outside</u> the Graduate Major in Life Science and Technology standard curriculum					
Total required credits		**A minimum of 30 credits in addition to meeting the above conditions**				
Note		**・Japanese Language and Culture Courses offered to International Students can be recognized as Humanities and Social Science Courses of the corresponding course level.** **・As for Liberal Arts and Basic Science Courses, please refer to the relevant pages.**				

5. IGP Courses

Table M2 shows the courses from the core course group for the Master's Degree Program of this major.

Table M2. Core Courses of the Graduate Major in Life and Science Technology

Course category		Course Number	Course			Credits	Competencies	Learning goals	Comments
Research Seminars	400 level	LST.Z491.R	◎	★	LST Seminar S1	0-0-2	1,2,3,4,5	A,C	
		LST.Z492.R	◎	★	LST Seminar F1	0-0-2	1,2,3,4,5	A,C	
	500 level	LST.Z591.R	◎	★	LST Seminar S2	0-0-2	1,2,3,4,5	A,C	
		LST.Z592.R	◎	★	LST Seminar F2	0-0-2	1,2,3,4,5	A,C	
Research-Related Courses	400 level	LST.B401.R	◎	★	MS Qualifying Presentation 1	0-1-0	3,4	A,C	
		LST.B402.R	◎	★	MS Qualifying Presentation 2	0-1-0	2,3,5	A,C	
		LST.B403.R	◎	★	LST Directed Laboratory Work	0-0-2	2,3,5	A,C	
Major Courses	400 level	LST.A401.L		★	Molecular and Cellular Biology	2-0-0	3,4	B,D	
		LST.A402.L		★	Organic and Bioorganic Chemistry	2-0-0	3,5	B,D	
		LST.A403.L		★	Biophysics	2-0-0	1,3,4,5	B,D	
		LST.A404.L		★	Cell Physiology	2-0-0	3,4	B,D	
		LST.A405.L		★	Design of Bioactive Molecules	2-0-0	3	B,D	
		LST.A406.L		★	Molecular Developmental Biology and Evolution	2-0-0	2,3,4,5	B,D	
		LST.A407.L		★	Science of Metabolism	2-0-0	3,4,5	B,D	
		LST.A408.L		★	Computational Biology	2-0-0	3	B,D	
		LST.A409.L		★	Physical Biology of the Cell	2-0-0	3	B,D	
		LST.A410.L		★	Advanced Neuroscience	2-0-0	3,5	B,D	
		LST.A411.L		★	Biomolecular Engineering	2-0-0	1,3,5	B,D	
		LST.A412.L		★	Biomaterial Science and Engineering	2-0-0	1,3,4,5	B,D	

		LST.A413.L			Career Development Seminars	2-0-0	2,5	B,D,E	
		LST.A414.L			LST Frontier Seminar 1	1-0-0	3	A,B	
		LST.A415.L			LST Frontier Seminar 2	1-0-0	3	A,B	
		LST.A416.L			LST Academic Writing 1	2-0-0	2,5	C	
		LST.A417.L		★	Advanced Biological Science and Engineering (Tsinghua University)	2-0-0	1,3,4,5	B,D	
		LST.A418.L	◎	★	Directed Collaboration Works	2-0-0	2,3,4	B,C,D	Required for IGP (C) students
	500 level	LST.A501.L		★	Biomolecular Analysis	2-0-0	3,5	B,D	
		LST.A502.L		★	Science of Biological Resources	2-0-0	3,5	B,D	
		LST.A503.L		★	Environmental Microbiology	2-0-0	1,3,4,5	B,D	
		LST.A504.L		★	Medical Biotechnology	2-0-0	1,3,5	B,D	
		LST.A505.L		★	LST Academic Writing 2	2-0-0	1,2,4,5	C,D	
		LST.A506.L			LST Frontier Seminar 3	1-0-0	3	A,B	
		LST.A507.L			LST Frontier Seminar 4	1-0-0	3	A,B	
		LST.C501.L		★	MS Internship 1	0-1-0	2,3,4,5	D,E	
		LST.C502.L		★	MS Internship 2	0-2-0	2,3,4,5	D,E	
		LST.C503.L		★	MS Internship 3	0-4-0	2,3,4,5	C,D,E	
		LST.C504.L		★	MS Internship 4	0-6-0	2,3,4,5	C,D,E	
		LST.C505.L		★	Short-term Internship on Computational Life Sciences	0-0-1	2,4,5	B,D	
		LST.C506.L		★	Overseas Research Training 1 (Tsinghua University)	0-1-0	2,3	B,D	
		LST.C507.L		★	Overseas Research Training 2 (Tsinghua University)	0-1-0	2,3	B,D	

Major Courses and Research-Related Courses outside the Graduate Major in Life Science and Technology standard curriculum	400 level	ZBA.A402			Creative Collaboration Works on Life Sciences (ACLS)	1-1-0	2,3,5	C,D	can be included in the required 30 credits
		ZBA.A403		★	Global Presentation on Computational Life Sciences A (ACLS)	2-0-0	2	D	can be included in the required 30 credits
		ZBA.A404		★	Global Presentation on Computational Life Sciences B	2-0-0	2	D	can be included in the required 30 credits
		ZBA.A405		★	Global Communication on Computational Life Sciences A (ACLS)	2-0-0	1,2	D	can be included in the required 30 credits
		ZBA.A406		★	Global Communication on Computational Life Sciences B (ACLS)	2-0-0	1,2	D	can be included in the required 30 credits
		ZBA.A407			Introduction to Business Plan (ACLS)	1-0-0	3	B,E	can be included in the required 30 credits
		ZBA.A408			Introduction to Bioethics (ACLS)	1-0-0	1,3	B,E	can be included in the required 30 credits
		ZBA.A409			Topics 1 in Computational Life Sciences (ACLS)	1-0-0	3	A,B	can be included in the required 30 credits
		ZBA.A410			Topics 2 in Computational Life Sciences (ACLS)	1-0-0	3	A,B	can be included in the required 30 credits
		ZBD.A401			Human Anatomy and Pathology	1-0-0	3	B	can be included in the required 30 credits
		ZBD.A402			Advanced Bioinformatics	1-0-0	3	B	can be included in the required 30 credits
		ZBD.A403			Advanced Biosensing Systems	2-0-0	3	B	can be included in the required 30 credits
		ACL.C401		★	International Internship on Computational Life Sciences for Master's Students	0-0-4	1,2,3,4,5	D,E	can be included in the required 30 credits
					Any Major Courses in other Graduate Majors				can be included in the required 30 credits
	500 level	ZBA.A501		★	Global Writing on Computational Life Sciences	2-0-0	1,2	D	can be included in the required 30 credits
		ZBA.A502		★	Global Debate on Computational Life Sciences	2-0-0	2	D	can be included in the required 30 credits
		ZBA.A503			Topics 3 in Computational Life Sciences (ACLS)	1-0-0	3	A,B	can be included in the required 30 credits
		ZBA.A504			Topics 4 in Computational Life Sciences (ACLS)	1-0-0	3	A,B	can be included in the required 30 credits
					Any Major Courses in other Graduate Majors				can be included in the required 30 credits

・◎：Required course, ★：Course given in English
・Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills;
5 = Practical and/or problem-solving skills
・The character preceding the three digits in the LST course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D400.R): A (Major course), B (Research-related course), C (Internship), Z (Research seminars).
・Students starting in spring should take MS Qualifying Presentation 1, LST Directed Laboratory Work, and MS Qualifying Presentation 2 in 2Q, 3Q, and 4Q, respectively. Those starting in fall should take MS Qualifying Presentation 1, LST Directed Laboratory Work, and MS Qualifying Presentation 2 in 4Q, 1Q, and 2Q, respectively.
・To sign up for MS Internship 1-4, students must obtain approval from teaching staffs in charge by submitting the application form approximately 2 months prior to the start date of the internship.
・If students complete Introduction to Business Plan (ACLS), Introduction to Bioethics (ACLS), Global Writing on Computational Life Sciences, or Global Debate on Computational Life Sciences, they cannot take Introduction to Business Plan for Doctoral Students, Introduction to Bioethics for Doctoral Students, Global Writing on Computational Life Sciences for Doctoral Students, or Global Debate on Computational Life Sciences for Doctoral Students, respectively, at the 600 level.

6. IGP Courses That Can be Recognized as Humanities and Social Science Courses

None

7. IGP Courses That Can be Recognized as Career Development Courses

To complete the Master's Degree Program for this major, students must generally earn all of the Graduate Attributes (GA) shown in the course guide for the Liberal Arts and Basic Science Course group. Students must earn 2 or more credits in addition to meeting the GA requirements, and GA credit acquisition is determined by major at the time of completion.

To earn these GA, in addition to the Career Development Courses, courses from Table M3 are offered as Major Courses that can be counted as Career Development Courses. Keep in mind that if a relevant course is counted as a Career Development Course, students won't be able to include it as a Major Course to meet the completion requirements.

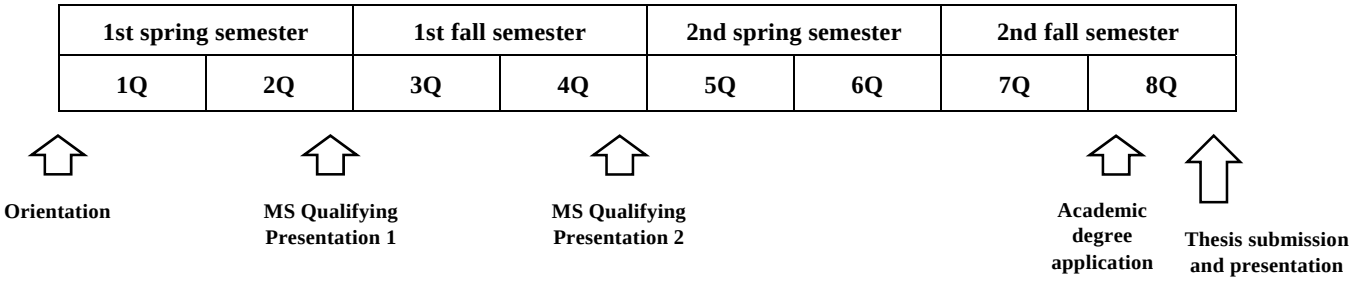
Table M3. Courses of the Graduate Major in Life Science and Technology that can be recognized as Career Development Courses

Course category	Course Number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	LST.A413.L			Career Development Seminars	2-0-0	C0M C1M	B,D,E	
	LST.C501.L		★	MS Internship 1	0-1-0	C1M	D,E	
	LST.C502.L		★	MS Internship 2	0-2-0	C1M	D,E	
	LST.C503.L		★	MS Internship 3	0-4-0	C1M	C,D,E	
	LST.C504.L		★	MS Internship 4	0-6-0	C1M	C,D,E	
	LST.C505.L		★	Short-term Internship on Computational Life Sciences	0-0-1	C0M	B,D	
	LST.C506.L		★	Overseas Research Training 1 (Tsinghua University)	0-1-0	C1M	B,D	
	LST.C507.L		★	Overseas Research Training 2 (Tsinghua University)	0-1-0	C1M	B,D	
	ZBA.A407			Introduction to Business Plan (ACLS)	1-0-0	C0M	B,E	Course in ACLS
	ZBA.A408			Introduction to Bioethics (ACLS)	1-0-0	C1M	B,E	Course in ACLS
	ACL.C401		★	International Internship on Computational Life Sciences for Master's Students	0-0-4	C1M	D,E	Course in ACLS
	HCB.C432.A			Fundamentals of Research Application for Life Innovation	1-1-0	C0M C1M	A,D	Course in HCB
	HCB.C431.A			Off Campus Training I	0-0-1	C1M	D	Course in HCB
	HCB.C531.A			Off Campus Training II	0-0-2	C1M	D	Course in HCB
	HCB.C532.A			Off Campus Training III	0-0-4	C1M	D	Course in HCB

・★: Course given in English
・To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the course guide for the Liberal Arts and Basic Science Courses).
・When signing up for the courses in HBC, students should obtain approval from HBC in advance.
・GA*: Graduate Attribute; ACLS: Education Academy of Computational Life Sciences; HCB: Graduate Major in Human Centered Science and Biomedical Engineering

8. Research Related to the Completion of Master Theses

In master's thesis research, students improve their problem-setting, problem-solving, and communication skills through a series of research activities. A relevant research time line is shown in the following diagram.



- **Research concept presentation, interim research presentation**
  In order to be conscious of the background and goals of their own master's thesis research, students make a "research concept presentation" (MS Qualifying Presentation 1), where they submit a program for their entire research in 2Q. In 4Q, they make the "interim research presentation" (MS Qualifying Presentation 2). After the research concept presentation, if the major approves it, students may take 600-level Major Courses (with the exception of Humanities and Social Science Courses and Career Development Courses). However, keep in mind that these may not be counted as a requirement for master's program completion.

- **Thesis examination criteria**
  1) The self-written paper in the field of "Life Science and Technology" must include novel and original observations and insights, and describe own discussions.
  2) Existing research related to the paper's topic must be appropriately and systematically reviewed.
  3) The degree-seeking student must understand the results and significance of the research sufficiently.
  4) The main part must have been presented at an academic conference related to "Life Science and Technology", or the content must be at an equivalent level.

- **Procedure for thesis examination**
  The examination committee is comprised of 3 or more referees (2 or more teaching staffs in charge of the Life Science and Technology major). After the peer review by referees done in advance, an oral presentation is made and a final examination and evaluation are performed. Examinations of candidates for the doctor's program are performed by 5 or more referees (3 or more teaching staffs in charge of the Life Science and Technology major).

[Doctoral Degree Program]

1. Outline

With high ethical standard and a broad range of exceptional expertise centered on the “Life Science and Technology” field, professional talents for science and technology are cultivated with skills to advance world top level research and development, create new technologies, and exhibit leadership on the international stage.

2. Competencies Developed

In this program, students aim to acquire the following skills at a level higher than in the Master’s Degree Program in order to achieve the above objectives.

- Broad, exceptional expertise centered on the “Life Science and Technology” field
- Exceptional problem-setting and problem-solving skills underpinned by expertise and high ethical standard, as well as the innovative creativity to pioneer new theoretical paradigms and technologies
- Exceptional sophistication and communicating skills for exhibiting leadership on the global stage

3. Learning Goals

In order to acquire the skills listed in “Competencies Developed”, students in this program will have the following trainings.

A) Acquiring exceptional expertise centered on the “Life Science and Technology” field
Advancing expertise in the research field of “Life Science and Technology” and ability to evaluate research in that field through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

B) Acquiring research-executing skills, problem-setting skills, problem-solving skills, and innovative creativity
Acquiring exceptional research-executing skills, problem-setting skills, problem-solving skills, and academic writing skills, as well as the innovative creativity to pioneer new theoretical paradigms and technologies through Research Seminars, Research-Related Courses, and exercises and experiments in Major Courses

C) Acquiring international communication skills
Learning exceptional communication skills for exhibiting leadership on the global stage through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses.

D) Acquiring research-planning and -organizing skills and leadership
Learning skills to plan and lead advanced research as a next-generation leader through Career Development Courses, Research Seminars, and exercises and experiments in Major Courses

E) Nurturing sophistication in relation to bioethics and society
Developing strong ethical and social views towards life and research in “Life Science and Technology” through Humanities and Social Science Courses, Career Development Courses, and exercises and experiments in Major Courses

4. IGP Completion Requirements

Table D1 shows the course classification for this major and the number of credits needed to complete the Doctoral Degree Program. The necessary number of credits is specified by course category and by course group. The column on the right shows the learning goals related to the courses. Students should have a good understanding of the relationship between the course and the learning goals when signing up for the course.

The following requirements must be met to complete the Doctoral Degree Program of this major.

1. A total of 24 credits or more acquired from 600-level courses.
2. From the courses specified in the Graduate Major in Life Science and Technology curriculum,
   - 12 credits acquired from Research Seminars;
   - 4 credits acquired from Research-Related Courses;
   - IGP (C) students are recommended to acquire IGP Off-Campus Training I or II (1 credit each);
   - a minimum of 6 credits acquired from Liberal Arts and Basic Science Courses
     (2 credits from 600-level Humanities and Social Science Courses, and 4 credits from 600-level Career Development Courses).
3. Pass the doctoral thesis review and defense.

Table D1. Graduate Major in Life Science and Technology Completion Requirements

Course category		**<Required courses> Required credits**	**<Electives> Minimum credits required**	**Minimum credits required**	**Associated learning goals**	**Comments**
Liberal Arts and Basic Science Courses	**Humanities and Social Science Courses**		2 credits	6 credits	C,D,E	
	Career Development Courses		4 credits		C,E	
	Other Courses					
Core Courses	**Research Seminars**	LST Seminar S3 LST Seminar F3 LST Seminar S4 LST Seminar F4 LST Seminar S5 LST Seminar F5 A total of 12 credits, 2 credits each from the above courses.		16 credits from Core Courses of the Graduate Major standard curriculum	A,B,C,D	
	Research-Related Courses	PhD Qualifying Presentation 1 PhD Qualifying Presentation 2 A total of 4 credits, 2 credits each from the above courses.			A,B	
	Major Courses					
Total required credits		**A minimum of 24 credits in addition to meeting the above conditions**				
Note		**・Japanese Language and Culture Courses offered to International Students can be recognized as Humanities and Social Science Courses of the corresponding course level.** **・As for Liberal Arts and Basic Science Courses, please refer to the relevant pages.**				

5. IGP Courses

Table D2 shows the courses from the core course group for the doctoral program of this major.

Table D2. Core Courses of the Graduate Major in Life Science and Technology

Course category		Course Number	Course			Credits	Competencies	Learning goals	Comments
Research Seminars	600 level	LST.Z691.R	◎	★	LST Seminar S3	0-0-2	1,2,3,4,5	A,B,D	
		LST.Z692.R	◎	★	LST Seminar F3	0-0-2	1,2,3,4,5	A,B,D	
		LST.Z693.R	◎	★	LST Seminar S4	0-0-2	1,2,3,4,5	A,B,D	
		LST.Z694.R	◎	★	LST Seminar F4	0-0-2	1,2,3,4,5	A,B,D	
		LST.Z695.R	◎	★	LST Seminar S5	0-0-2	1,2,3,4,5	A,B,D	
		LST.Z696.R	◎	★	LST Seminar F5	0-0-2	1,2,3,4,5	A,B,D	
Research-Related Courses	600 level	LST.B601.R	◎	★	PhD Qualifying Presentation 1	0-2-0	2,3,5	A,B	
		LST.B602.R	◎	★	PhD Qualifying Presentation 2	0-2-0	2,3,5	A,B	
Major Courses	600 level	LST.B603.L		★	LST Bioleader Training 1	0-2-0	2,3,4	B,D	
		LST.B604.L		★	LST Bioleader Training 2	0-2-0	2,3,4	B,D	
		LST.C601.L		★	PhD Internship 1	0-1-0	2,3,4,5	A,C,E	
		LST.C602.L		★	PhD Internship 2	0-2-0	2,3,4,5	A,C,E	
		LST.C603.L		★	PhD Internship 3	0-4-0	2,3,4,5	A,B,C,E	
		LST.C604.L		★	PhD Internship 4	0-6-0	2,3,4,5	A,B,C,E	
		LST.C605.L			Career Development in Industry	0-0-4	2,3,4,5	A,B,C,E	Course in the Graduate Program for Working Adults
		LST.C607.L		★	IGP Off-Campus Training I	0-1-0	1,2,4,5	A,C,E	Recommended for IGP (C) students
		LST.C608.L		★	IGP Off-Campus Training II	0-1-0	1,2,4,5	A,C,E	Recommended for IGP (C) students

Major Courses and Research-Related Courses outside the Graduate Major in Life Science and Technology standard curriculum	600 level	ACL.A601			Introduction to Business Plan for Doctoral Students	1-0-0	4,5	B,E	can be included in the required 24 credits
		ACL.A602			Introduction to Bioethics for Doctoral Students	1-0-0	3,4,5	B,E	can be included in the required 24 credits
		ACL.A603		★	Global Writing on Computational Life Sciences for Doctoral Students	2-0-0	1,2,4,5	C	can be included in the required 24 credits
		ACL.A604		★	Global Debate on Computational Life Sciences for Doctoral Students	2-0-0	1,2	C	can be included in the required 24 credits
		ACL.A631			Topics 1 in Computational Life Sciences for Doctoral Students	1-0-0	3,4,5	A,B	can be included in the required 24 credits
		ACL.A632			Topics 2 in Computational Life Sciences for Doctoral Students	1-0-0	3,4	A,B	can be included in the required 24 credits
		ACL.A633			Topics 3 in Computational Life Sciences for Doctoral Students	1-0-0	3	A,B	can be included in the required 24 credits
		ACL.A634			Topics 4 in Computational Life Sciences for Doctoral Students	1-0-0	3,4,5	A,B	can be included in the required 24 credits
		ACL.C601		★	International Internship on Computational Life Sciences for Doctoral Students	0-0-4	1,2,3,4,5	A,C,E	can be included in the required 24 credits
					Any Major Courses in other Graduate Majors				can be included in the required 24 credits

・◎ : Required course, ★ : Course given in English

・Competencies: 1 = Intercultural skills; 2 = Communication skills; 3 = Specialist skills; 4 = Critical thinking skills; 5 = Practical and/or problem-solving skills

· The character preceding the three digits in the LST course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D400.R): A (Major course), B (Research-related course), C (Internship), Z (Research seminars).

・Students starting in spring should take PhD Qualifying Presentation 1 and 2 in 4Q, while those starting in fall should take them in 2Q.

・Students should sign up for LST Bioleader Training 1 and 2 in 1Q.

・To sign up for PhD Internship 1-4, students must obtain approval from teaching staffs in charge by submitting the application form approximately 2 months prior to the start date of the internship.

・Students cannot sign up for Introduction to Business Plan for Doctoral Students, Introduction to Bioethics for Doctoral Students, Global Writing on Computational Life Sciences for Doctoral Students, or Global Debate on Computational Life Sciences for Doctoral Students if they have completed Introduction to Business Plan (ACLS), Introduction to Bioethics (ACLS), Global Writing on Computational Life Sciences, or Global Debate on Computational Life Sciences, respectively, at the 400-500 levels.

6. IGP Courses That Can be Recognized as Humanities and Social Science Courses

None

7. IGP Courses That Can be Recognized as Career Development Courses

To complete the Doctoral Degree Program for this major, students must generally earn all of the Graduate Attributes (GA) shown in the course guide for the Liberal Arts and Basic Science Courses group. Students must earn 4 or more credits in addition to meeting the GA requirements, and GA credit acquisition is determined by major at the time of completion.

To earn these GA, in addition to the Career Development Courses, courses from Tables D3-1 and D3-2 are offered as Major Courses that can be counted as Career Development Courses. Keep in mind that if a relevant course is counted as a Career Development Course, students won't be able to include it as a Major Course to meet the completion requirements.

Table D3-1 Courses of the Graduate Major in Life Science and Technology that can be recognized as Career Development Courses in the Academic Leader Program (ALP)

Course category	Course Number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	LST.C601.L		★	PhD Internship 1	0-1-0	A1D A2D A3D	A,C,E	
	LST.C602.L		★	PhD Internship 2	0-2-0	A1D A2D A3D	A,C,E	
	LST.C603.L		★	PhD Internship 3	0-4-0	A1D A2D A3D	A,B,C,E	
	LST.C604.L		★	PhD Internship 4	0-6-0	A1D A2D A3D	A,B,C,E	
	LST.C605.L			Career Development in Industry	0-0-4	A2D A3D	A,B,C,E	Course in the Graduate Program for Working Adults
	LST.C607.L		★	IGP Off-Campus Training I	0-1-0	A1D A2D A3D	A,C,E	
	LST.C608.L		★	IGP Off-Campus Training II	0-1-0	A1D A2D A3D	A,C,E	
	ACL.A601			Introduction to Business Plan for Doctoral Students	1-0-0	A0D	B,E	Course in ACLS
	ACL.A602			Introduction to Bioethics for Doctoral Students	1-0-0	A0D	B,E	Course in ACLS
	ACL.C601		★	International Internship on Computational Life Sciences for Doctoral Students	0-0-4	A1D A2D A3D	A,C,E	Course in ACLS
	HCB.C631.A		★	HCB International Internship	0-0-4	A2D A3D	B,C,D	Course in HCB
	HCB.C632.A			Research Working in Company	0-2-2	A2D A3D	B,C,D	Course in HCB

・★:Course given in English
・To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the course guide for the Liberal Arts and Basic Science Courses).
・When signing up for the courses in HBC, students should obtain approval from HCB in advance.
・GA*: Graduate Attribute; HCB: Graduate Major in Human Centered Science and Biomedical Engineering

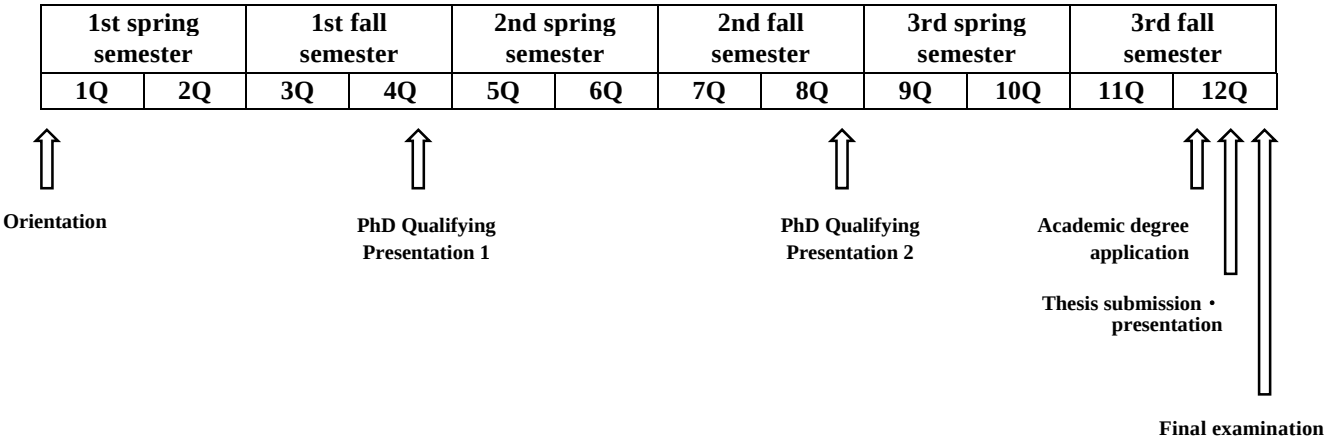
Table D3-2 Courses of the Graduate Major in Life Science and Technology that can be recognized as Career Development Courses in the Productive Leader Program (PLP)

Course category	Course Number	Course			Credits	GA*	Learning goals	Comments
can be recognized as Career Development Courses	LST.C601.L		★	PhD Internship 1	0-1-0	P1D P2D P3D	A,C,E	
	LST.C602.L		★	PhD Internship 2	0-2-0	P1D P2D P3D	A,C,E	
	LST.C603.L		★	PhD Internship 3	0-4-0	P1D P2D P3D	A,B,C,E	
	LST.C604.L		★	PhD Internship 4	0-6-0	P1D P2D P3D	A,B,C,E	
	LST.C605.L			Career Development in Industry	0-0-4	P2D P3D	A,B,C,E	Course in the Graduate Program for Working Adults
	LST.C607.L		★	IGP Off-Campus Training I	0-1-0	P1D P2D P3D	A,C,E	
	LST.C608.L		★	IGP Off-Campus Training II	0-1-0	P1D P2D P3D	A,C,E	
	ACL.A601			Introduction to Business Plan for Doctoral Students	1-0-0	P0D	B,E	Course in ACLS
	ACL.A602			Introduction to Bioethics for Doctoral Students	1-0-0	P0D	B,E	Course in ACLS
	ACL.C601		★	International Internship on Computational Life Sciences for Doctoral Students	0-0-4	P1D P2D P3D	A,C,E	Course in ACLS
	HCB.C631.A		★	HCB International Internship	0-0-4	P2D P3D	B,C,D	Course in HCB
	HCB.C632.A			Research Working in Company	0-2-2	P2D P3D	B,C,D	Course in HCB

・★:Course given in English
・To satisfy the Career Development requirement, credits may be acquired from courses listed above as well as from those listed under Career Development Courses (see the course guide for the Liberal Arts and Basic Science Courses).
・When signing up for the courses in HBC, students should obtain approval from HCB in advance.
・GA*: Graduate Attribute; HCB: Graduate Major in Human Centered Science and Biomedical Engineering

8. Research Related to the Completion of Doctoral Theses

In doctoral dissertation research, students cultivate their problem-setting and problem-solving skills, and improve their English communication skills through a series of research processes. A relevant dissertation research time line is shown in the following diagram. In 4Q and 8Q, students make the interim presentation (PhD Qualifying Presentation 1 and 2). Continuing on, they submit and present their thesis in 12Q.



- **Doctoral dissertation examination criteria**

  1) The self-written paper in the field of “Life Science and Technology” must be novel and original, with sufficient academic significance.
  2) The main part must have been published or be accepted for publication in an international, peer-reviewed academic journal, with the degree-seeking student as a mainly-contributing author.
  3) The degree-seeking student must have sufficient linguistic skills to carry out research internationally.

- **Procedure for doctoral dissertation examination**

  The examination committee is comprised of 5 or more referees (3 or more teaching staffs in charge of the Graduate Major in Life Science and Technology). After an oral presentation and peer review by the referees, a final examination and evaluation, including those of linguistic skills, are performed.