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, Entrepreneurship 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, Entrepreneurship Courses, and exercises and experiments in Major Courses

4. IGP Completion Requirements

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

1. Attain a total of 30 credits or more 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;
    - 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 Entrepreneurship Courses).
3. Pass the master's thesis review and defense.

Table M1 shows course categories and the number of credits required to complete the Master's Degree Program of this major. It also shows the required minimum credits in each course category and points to be noted when selecting the required courses and electives.

The learning goals to be obtained by students through courses are listed as "associated learning goals". Prior to registering courses, students need to fully understand the course goals.

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	
	Entrepreneurship Courses		・2 credits		D,E	All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)
	Other Courses					
Core Courses	**Research Seminars**	・LST Seminar S1 ・LST Seminar F1 ・LST Seminar S2 ・LST Seminar F2 A total of 8 credits, 2 credits 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		・8 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 including those attained according to the above conditions**				
Note		**・Japanese Language and Culture Courses offered to international students can be recognized as equivalent to the Humanities and Social Science Courses of the corresponding course level.** **・For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.**				

5. IGP Courses

Table M2 shows the Core Courses of the Master's Degree Program in this major. Graduate Majors listed in the Comments column offer core courses that are recognized as equivalent to the corresponding Major Courses or Research-related Courses in the standard curriculum of this major.

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

Course category		Course number	Course title			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	1,4	A,C	
		LST.B402.R	◎	★	MS Qualifying Presentation 2	0-1-0	1,3,5	A,C	
		LST.B403.R	◎	★	LST Directed Laboratory Work	0-0-2	1,3,4,5	A,C	
Major Courses	400 level	LST.A401.L		★	Molecular and Cellular Biology	2-0-0	1,2,4	B,D	
		LST.A403.L		★	Biophysics	2-0-0	1,2,4,5	B,D	
		LST.A404.L		★	Cell Physiology	2-0-0	1,2,4	B,D	
		LST.A405.L		★	Design of Bioactive Molecules	2-0-0	1,2	B,D	
		LST.A406.L		★	Molecular Developmental Biology and Evolution	2-0-0	1,2,3,4,5	B,D	
		LST.A407.L		★	Science of Metabolism	2-0-0	1,2,4,5	B,D	
		LST.A408.L		★	Computational Biology	2-0-0	1,2	B,D	
		LST.A409.L		★	Physical Biology of the Cell	2-0-0	1,2	B,D	
		LST.A410.L		★	Advanced Neuroscience	2-0-0	1,2,5	B,D	
		LST.A411.L		★	Biomolecular Engineering	2-0-0	1,2,5	B,D	
		LST.A412.L		★	Biomaterial Science and Engineering	2-0-0	1,2,4,5	B,D	
		LST.A413.L			Career Development Seminars	2-0-0	3,5	B,D,E	
		LST.A414.L			LST Frontier Seminar 1	1-0-0	1	A,B	
		LST.A415.L			LST Frontier Seminar 2	1-0-0	1	A,B	

		LST.A416.L			LST Academic Writing 1	2-0-0	3,5	C	
		LST.A417.L		★	Advanced Biological Science and Engineering (Tsinghua University)	2-0-0	1,2,4,5	B,D	(Tsinghua University)
		LST.A421.L		★	Functional Life Science	2-0-0	1,2	B,D	
		LST.A422.L		★	Bio DX Industrial Design	1-1-0	2,3,4,5	A,B,D,E	Recommended for IGP (C) students
		LST.A423		★	Functional Chemistry of Biomolecules	2-0-0	1,2,5	B,D	
		LST.B404.L		★	International Career Development Basics	1-1-0	2,3,4,5	B,C,D,E	Recommended for IGP (C) students
		LST.C402.L			The present state of digital transformation (DX) in Bio-industries	1-0-0	2,3,4,5	B,C,E	
		LST.C403.L			Ota City Start-up Experience Off-Campus Project	0.5-0-0.5	3,4,5	B,C	Offered by Academy of SSS
		LST.C404		★	Materials Simulation	2-0-0	1	B,C	Offered by MCT (XMC.A402)
		LST.C405		★	Materials Informatics	2-0-0	1	B,C	Offered by MCT (XMC.A404)
	500 level	LST.A501.L		★	Biomolecular Analysis	2-0-0	1,2,5	B,D	
		LST.A502.L		★	Science of Biological Resources	2-0-0	1,2,5	B,D	
		LST.A503.L		★	Environmental Microbiology	2-0-0	1,2,4,5	B,D	
		LST.A504.L		★	Medical Biotechnology	2-0-0	1,2,5	B,D	
		LST.A505.L		★	LST Academic Writing 2	2-0-0	2,3,4,5	C,D	
		LST.A510L		★	Molecular Simulation	1-1-0	1,5	A	Offered by AI (ART.T545)
		LST.C501.L			MS Internship 1	0-1-0	1,3,4,5	D,E	Offered in English as needed
		LST.C502.L			MS Internship 2	0-2-0	1,3,4,5	D,E	
		LST.C503.L			MS Internship 3	0-4-0	1,3,4,5	C,D,E	Offered in English as needed
		LST.C504.L			MS Internship 4	0-6-0	1,3,4,5	C,D,E	Offered in English as needed
		LST.C506.L		★	Overseas Research Training 1 (Tsinghua University)	0-1-0	1,2,3	B,D	(Tsinghua University)
		LST.C507.L		★	Overseas Research Training 2 (Tsinghua University)	0-1-0	1,2,3	B,D	(Tsinghua University)

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

・ Competencies: 1 = Specialist skills; 2 = Liberal arts skills; 3 = Communication skills; 4 = Applied skills (inquisitive thinking and/or problem-finding skills); 5 = Applied skills (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 who start in **spring** should take MS Qualifying Presentation 1 in 2Q, LST Directed Laboratory Work in 3Q–4Q, and MS Qualifying Presentation 2 in 4Q.
Students who start in **fall** should take MS Qualifying Presentation 1 in 4Q, LST Directed Laboratory Work in 1Q–2Q, and MS Qualifying Presentation 2 in 2Q.・To sign up for MS Internship 1-4, students must obtain approval from the head of the Graduate Major by submitting the application form approximately 2 months prior to the start date of the internship. For details on the credit registration procedure for internship courses, please refer to http://www.bio.titech.ac.jp/in/student/internship_kamoku.html.

6. IGP Courses That Can Be Counted as Humanities and Social Science Courses

None

7. IGP Entrepreneurship Courses and IGP Courses That Can Be Counted as Entrepreneurship Courses

In order to fulfill the completion requirements for the master's degree program, students must attain at least two credits in Entrepreneurship Courses, and should satisfy all of the Graduate Attributes (GAs) specified in Table M-1 of the "Entrepreneurship Courses" listed as "Liberal Arts and Basic Science Courses" in the Guide to Graduate Education and International Graduate Program, as well as shown below. Students will be evaluated in regards to GA achievements at the time of their degree completion. For courses with two GAs, both GAs stipulated for the courses are considered to be acquired if students attain the corresponding credits for those courses.

Entrepreneurship Courses and Major Courses that enable students to acquire GAs and are recognized as equivalent to Entrepreneurship Courses, offered by the Graduate Major, are listed in Table M3 below. Students can also acquire GAs and credits by taking the Entrepreneurship Courses offered by the Center for Entrepreneurship Education (CEE) listed as "Liberal Arts and Basic Science Courses" in the Guide to Graduate Education and International Graduate Program.

It must be noted that credits attained from courses that are recognized as equivalent to Entrepreneurship Courses can be counted towards the completion requirements of the master's degree program, either for Major Courses or for Entrepreneurship Courses (not for both). Nevertheless, even in cases where credits pertaining to courses that are not considered as Entrepreneurship Courses are attained, the associated GAs may be considered by the Graduate Major to have been acquired.

For Graduate Attributes, refer to the Guide to Entrepreneurship Courses.
The Graduate Attributes of the Master's Degree Program are listed in Table M-1 as follows:

GA0M: You can clearly plan your own career and recognize the abilities necessary for realizing it while considering ethics and relevance to societal problems.

GA1M: You can acquire the knowledge, skills, ethics and entrepreneurship necessary for realizing your planned career and contribute to societal problem-solving while collaborating with other experts

Table M3. Courses of the Graduate Major in Life Science and Technology recognized as equivalent to Career Development, and Entrepreneurship Courses

Courses

Course category	Course number	Course title			Credits	GA*	Learning goals	Comments
Courses that can be counted as Entrepreneurship Courses	LST.A413.L			Career Development Seminars	2-0-0	GA0M GA1M	B,D,E	
	LST.B404.L		★	International Career Development Basics	1-1-0	GA0M GA1M	B,C,D,E	Recommended for IGP (C) students
	LST.C402.L			The present state of digital transformation (DX) in Bio-industries	0.5-0-0.5	GA1M	B,C,E	
	LST.C403.L			Ota City Start-up Experience Off-Campus Project	0.5-0-0.5	GA1M	B,C	SSS.S433
	LST.C501.L			MS Internship 1	0-1-0	GA1M	D,E	Offered in English as needed
	LST.C502.L			MS Internship 2	0-2-0	GA1M	D,E	Offered in English as needed
	LST.C503.L			MS Internship 3	0-4-0	GA1M	C,D,E	Offered in English as needed
	LST.C504.L			MS Internship 4	0-6-0	GA1M	C,D,E	Offered in English as needed
	LST.C506.L		★	Overseas Research Training 1 (Tsinghua University)	0-1-0	GA0M	B,D	(Tsinghua University)
	LST.C507.L		★	Overseas Research Training 2 (Tsinghua University)	0-1-0	GA1M	B,D	(Tsinghua University)
Entrepreneurship Courses	LST.C508			Master's Recurrent Program 2 of (Life Science and Technology)	0-0-2	GA0M GA1M		Entrepreneurship Course offered by the Graduate Major in Life Science and Technology. (Cannot be counted for Major Courses)

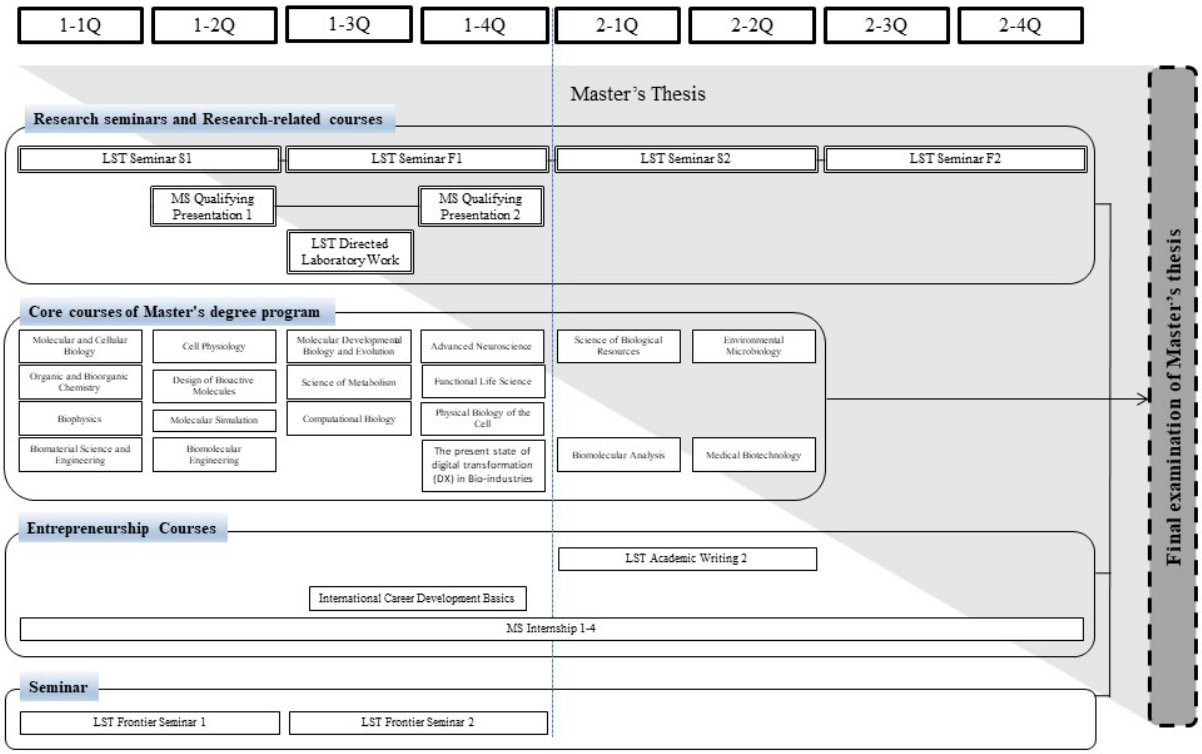
・★: Course given in English

・Credits in Entrepreneurship Courses must be attained from among the above-listed courses and those listed as such in the Liberal Arts and Basic Science Courses Guide.

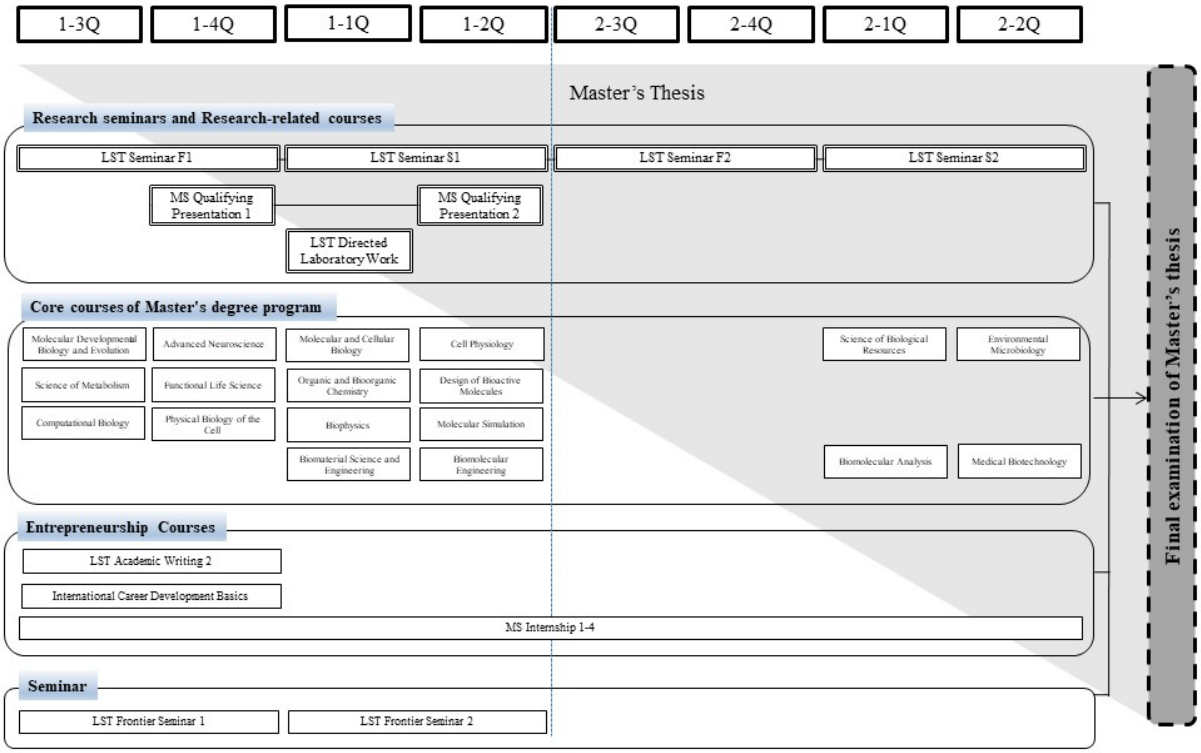
・GA*: Graduate Attributes

The Center of Data Science and Artificial Intelligence may offer courses that are recognized as equivalent to Entrepreneurship Courses in addition to those listed under “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program. For details about available courses or completion requirements, please refer to the study guide of the center.

April Admission 【Life Science and Technology （Master's degree）】 Required | Required elective or elective

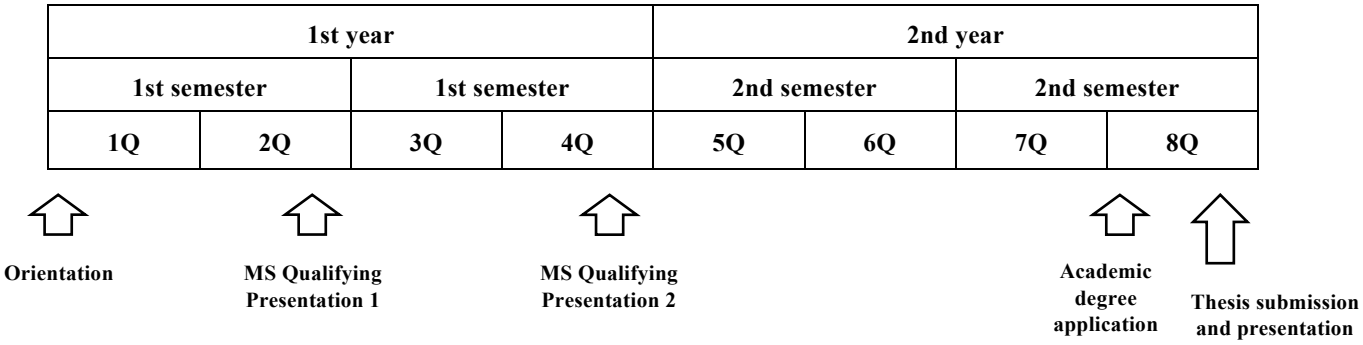


Fall Admission 【Life Science and Technology （Master's degree）】 Required | Required elective or elective



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 Entrepreneurship 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, Entrepreneurship 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 Entrepreneurship 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, Entrepreneurship Courses, and exercises and experiments in Major Courses

4. IGP Completion Requirements

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

1. Attain a total of 24 credits or more 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;
    - 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 Entrepreneurship Courses).
3. Pass the doctoral thesis review and defense.

Table D1 shows course categories and the number of credits required to complete the Doctoral Degree Program of this major. It also shows the required minimum credits in each course category and points to be noted when selecting the required courses and electives.

The learning goals to be obtained by students through courses are listed as “associated learning goals”. Prior to registering courses, students need to fully understand the course goals.

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

<table>
<tr><th colspan="2">Course category</th><th><Required courses>
Required credits</th><th><Electives>
Minimum credits required</th><th>Minimum credits required</th><th>Associated learning goals</th><th>Comments</th></tr>
<tr><td rowspan="3">Liberal Arts and Basic Science Courses</td><td>Humanities and Social Science Courses</td><td></td><td>2 credits</td><td rowspan="3">6 credits</td><td>C,E</td><td></td></tr>
<tr><td>Entrepreneurship Courses</td><td></td><td>4 credits</td><td>C,E</td><td>All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.)</td></tr>
<tr><td>Other Courses</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Core Courses</td><td>Research Seminars</td><td>・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.</td><td></td><td rowspan="3">16 credits from Core Courses of the Graduate Major standard curriculum</td><td>A,B,C,D</td><td></td></tr>
<tr><td>Research-Related Courses</td><td>・PhD Qualifying Presentation 1
・PhD Qualifying Presentation 2

A total of 4 credits, 2 credits each from the above courses.</td><td></td><td>A,B</td><td></td></tr>
<tr><td>Major Courses</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Major Courses and Research-Related Courses <u>outside</u> the Graduate Major in Life Science and Technology standard curriculum</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Total required credits</td><td colspan="5">A minimum of 24 credits including those attained according to the above conditions</td></tr>
<tr><td colspan="2">Note</td><td colspan="5">・Japanese Language and Culture Courses offered to international students can be recognized as equivalent to the Humanities and Social Science Courses of the corresponding course level.
・For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.</td></tr>
</table>

5. IGP Courses

Table D2 shows the Core Courses of the Doctoral Degree Program of this major. Graduate Majors listed in the Comments column offer core courses that are recognized as equivalent to the corresponding Major Courses or Research-related Courses in the standard curriculum of this major.

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

Course category		Course number	Course title			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	Offered in English as needed
		LST.Z692.R	◎		LST Seminar F3	0-0-2	1,2,3,4,5	A,B,D	Offered in English as needed
		LST.Z693.R	◎		LST Seminar S4	0-0-2	1,2,3,4,5	A,B,D	Offered in English as needed
		LST.Z694.R	◎		LST Seminar F4	0-0-2	1,2,3,4,5	A,B,D	Offered in English as needed
		LST.Z695.R	◎		LST Seminar S5	0-0-2	1,2,3,4,5	A,B,D	Offered in English as needed
		LST.Z696.R	◎		LST Seminar F5	0-0-2	1,2,3,4,5	A,B,D	Offered in English as needed
Research-Related Courses	600 level	LST.B601.R	◎		PhD Qualifying Presentation 1	0-2-0	1,3,5	A,B	Offered in English as needed
		LST.B602.R	◎		PhD Qualifying Presentation 2	0-2-0	1,3,5	A,B	Offered in English as needed
Major Courses	600 level	LST.B603.L			LST Bioleader Training 1	0-2-0	1,3,4	B,D	Offered in English as needed
		LST.B604.L			LST Bioleader Training 2	0-2-0	1,3,5	B,D	Offered in English as needed
		LST.B605.L		★	International Career Development Advanced	1-1-0	1,2,3,4,5	B,C,D,E	Recommended for IGP (C) students
		LST.C601.L			PhD Internship 1	0-1-0	1,3,4,5	A,C,E	Offered in English as needed
		LST.C602.L			PhD Internship 2	0-2-0	1,3,4,5	A,C,E	Offered in English as needed
		LST.C603.L			PhD Internship 3	0-4-0	1,3,4,5	A,B,C,E	Offered in English as needed
		LST.C604.L			PhD Internship 4	0-6-0	1,3,4,5	A,B,C,E	Offered in English as needed
		LST.C609.L			Cooperative Education through Research Internships of (Life Science and Technology 1)	0-0-4	1,3,4,5	A,B,C,E	
		LST.C610.L			Cooperative Education through Research Internships of (Life Science and Technology 2)	0-0-6	1,3,4,5	A,B,C,E	

・ ◎ : Required course, ★ : Course given in English
・ Competencies:-1 = Specialist skills; 2 = Liberal arts skills; 3 = Communication skills; 4 = Applied skills (inquisitive thinking and/or problem-finding skills); 5 = Applied skills (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.D600.R): A (Major course), B (Research-related course), C (Internship), Z (Research seminars).
・Students should take PhD Qualifying Presentation 1 and 2 refer to the diagram on page 16.
・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 the head of Graduate Major by submitting the application form approximately 2 months prior to the start date of the internship. For details on the credit registration procedure for internship courses, please refer to http://www.bio.titech.ac.jp/in/student/internship_kamoku.html.

6. IGP Courses That Can Be Counted as Humanities and Social Science Courses

None

7. IGP Entrepreneurship Courses and IGP Courses That Can Be Counted as Entrepreneurship Courses

In order to fulfill the completion requirements for the doctoral degree program, students must attain at least four credits in Entrepreneurship Courses, and should satisfy all of the Graduate Attributes (GAs) specified in Table D-1 of the "Entrepreneurship Courses" listed as "Liberal Arts and Basic Science Courses" in the Guide to Graduate Education and International Graduate Program, as well as shown below. Students will be evaluated in regards to GA achievements at the time of their degree completion. For courses with two GAs, both GAs stipulated for the courses are considered to be acquired if students attain the corresponding credits for those courses.

Entrepreneurship Courses and Major Courses that enable students to acquire GAs and are recognized as equivalent to Entrepreneurship Courses, offered by the Graduate Major, are listed in Table D3 below. Students can also acquire GAs and credits by taking the Entrepreneurship Courses offered by the Center for Entrepreneurship Education (CEE) listed as "Liberal Arts and Basic Science Courses" in the Guide to Graduate Education and International Graduate Program.

It must be noted that credits attained from courses that are recognized as Entrepreneurship Courses can be counted towards the completion requirements of the doctoral degree program, either for Major Courses or for Entrepreneurship Courses (not for both). Nevertheless, even in cases where credits pertaining to courses that are not considered as Entrepreneurship Courses are attained, the associated GAs may be considered by the Graduate Major to have been acquired.

For Graduate Attributes, refer to the Guide to Entrepreneurship Courses.
The Graduate Attributes of the Doctoral Degree Program are listed in Table D-1 as follows:
GA0D: You can clearly design your own career and contribute to realizing scientific, technological, or social innovation through a comprehensive understanding of the knowledge, skills, social responsibilities and ethics required to become an active member of academia and/or industry.
GA1D: You can lead in realizing scientific, technological, or social innovation by acquiring advanced leadership skills, entrepreneurship, knowledge and expertise, and by developing social responsibility necessary for materializing your designed career.

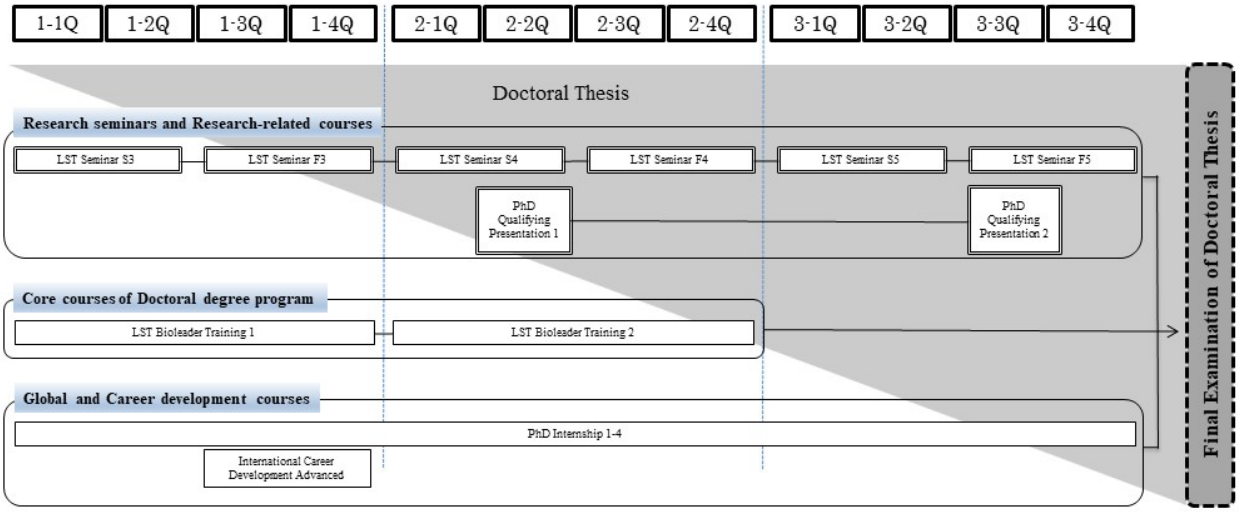
Table D3. Courses of the Graduate Major in Life Science and Technology recognized as equivalent to Entrepreneurship Courses , and Entrepreneurship Courses

Course category	Course number	Course title			Credits	Competencies	Learning goals	Comments
Courses that can be counted as Entrepreneurship Courses	LST.B603.L			LST Bioleader Training 1	0-2-0	GA0D GA1D	B,D	
	LST B604.L			LST Bioleader Training 2	0-2-0	GA0D GA1D	B,D	
	LST.B605.L		★	International Career Development Advanced	1-1-0	GA0D GA1D	B,C,D,E	
	LST.C601.L			PhD Internship 1	0-1-0	GA1D	A,C,E	Offered in English as needed
	LST.C602.L			PhD Internship 2	0-2-0	GA1D	A,C,E	Offered in English as needed
	LST.C603.L			PhD Internship 3	0-4-0	GA1D	A,B,C,E	Offered in English as needed
	LST.C604.L			PhD Internship 4	0-6-0	GA1D	A,B,C,E	Offered in English as needed
	LST.C609.L			Cooperative Education through Research Internships of (Life Science and Technology 1)	0-0-4	GA1D	A,B,C,E	
	LST.C610.L			Cooperative Education through Research Internships of (Life Science and Technology 2)	0-0-6	GA1D	A,B,C,E	
Entrepreneurship Courses	LST.C611			Doctoral Recurrent Program 4 of (Life Science and Technology)	0-0-4	GA0D GA1D		Entrepreneurship Course offered by the Graduate Major in Life Science and Technology. (Cannot be counted for Major Courses)

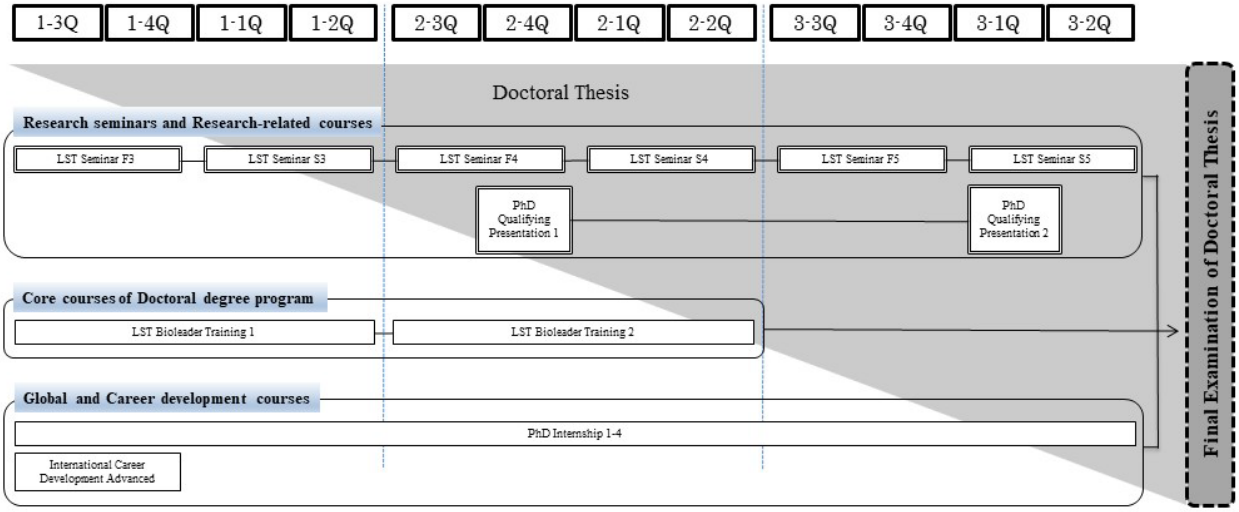
・★:Course given in English
・Credits in Entrepreneurship Courses must be attained from among the above-listed courses and those listed as such in the Liberal Arts and Basic Science Courses Guide.
・GA*: Graduate Attributes

The Center of Data Science and Artificial Intelligence may offer courses that are recognized as equivalent to Entrepreneurship Courses in addition to those listed under “Liberal Arts and Basic Science Courses” in the Guide to Graduate Education and International Graduate Program. For details about available courses or completion requirements, please refer to the study guide of the center. t

April Admission 【Life Science and Technology （Doctoral degree）】 Required | Required elective or elective

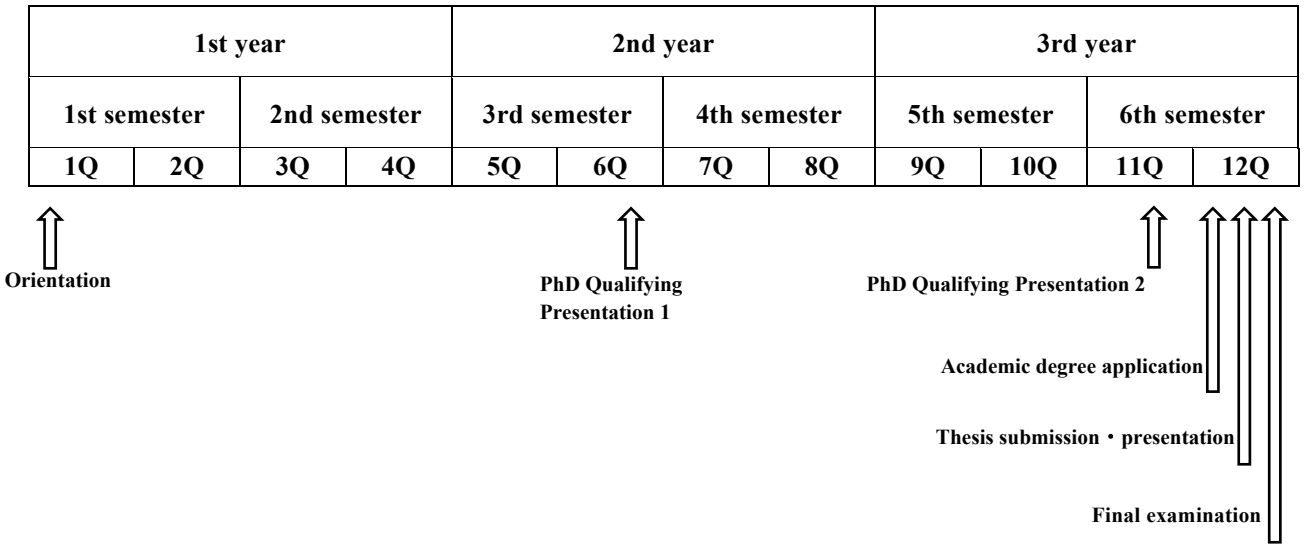


Fall Admission 【Life Science and Technology （Doctoral degree）】 Required | Required elective or elective



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 6Q and 11Q, 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.