# Graduate Major in Earth and Planetary Sciences

## 【Master's Degree Program】

### 1. Outline

Phenomena covered by earth and planetary sciences are complex combinations of various factors ranging from nano- to tera-scale in space and time. This program provides a variety of learning opportunities to foster human resources challenging and solving such global and planetary-scale problems with scientific thinking and skills.

### 2. Competencies Developed

Students in this program are expected to acquire the following abilities:

- Ability to gain insight into the nature of complex phenomena in the earth and planets
- Ability to set a subject of research and to form a research plan
- Ability to build own expertise necessary for research accomplishment
- Ability to present research achievements and take international leadership in an area of expertise

### 3. Learning Goals

Students in this program are expected to study by utilizing the following opportunities to obtain the abilities mentioned above:

A) Laboratory seminar to learn basics of scientific approaches in earth and planetary sciences
B) Interdisciplinary seminars to study a wide range of research topics
C) Lectures and exercise lessons to improve basic academic skills

### 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. Fulfill the requirements in Table M1 below.
3. Pass the master's dissertation 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". Before registering for courses, students need to fully understand the course goals.

**Table M1. Graduate Major in Earth and Planetary Sciences Completion Requirements**

<table>
<tr><th colspan="2">Course category</th><th><Required courses><br>Required credits</th><th><Electives><br>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 from 400-level<br>• 1 credit from 500-level</td><td rowspan="3">5 credits</td><td>C</td><td></td></tr>
<tr><td>Entrepreneurship Courses</td><td></td><td>2 credits</td><td>C</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="3">Core courses</td><td>Research seminars</td><td>Seminar in Earth and Planetary Sciences S1<br>Seminar in Earth and Planetary Sciences F1<br>Seminar in Earth and Planetary Sciences S2<br>Seminar in Earth and Planetary Sciences F2<br><br>A total of 8 credits, 2 credit each from the above courses.</td><td></td><td rowspan="3">22 credits</td><td>B</td><td></td></tr>
<tr><td>Research-related courses</td><td></td><td>4 credits, 1 credit each from sub-groups B, C, D, and E</td><td>A, B</td><td></td></tr>
<tr><td>Major courses</td><td></td><td>10 credits from sub-group A</td><td>A</td><td></td></tr>
<tr><td colspan="2">Total required credits</td><td colspan="5">A minimum of 30 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.<br>・For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.</td></tr>
</table>

## 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 Earth and Planetary Sciences**

| Course category | | Course number | Course title | | | Credits | Competencies | Learning goals | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | Category | Sub-group | Title | | | | |
| Research seminars | 400 level | EPS.Z491.R | ◎ ★ | | Seminar in Earth and Planetary Sciences S1 | 0-2-0 | 1,3 | B | |
| | | EPS.Z492.R | ◎ ★ | | Seminar in Earth and Planetary Sciences F1 | 0-2-0 | 1,3 | B | |
| | 500 level | EPS.Z591.R | ◎ ★ | | Seminar in Earth and Planetary Sciences S2 | 0-2-0 | 1,3 | B | |
| | | EPS.Z592.R | ◎ ★ | | Seminar in Earth and Planetary Sciences F2 | 0-2-0 | 1,3 | B | |
| Research-related courses | 400 level | EPS.E471.B | ○ ★ | B | Exercise in Earth and Planetary Sciences A | 0-1-0 | 1,4,5 | A,B | a minimum of 1 credit from Exercise in Earth and Planetary Sciences A and B |
| | | EPS.E472.B | ○ ★ | B | Exercise in Earth and Planetary Sciences B | 0-1-0 | 1,4,5 | A,B | |
| | | EPS.E473.C | ○ ★ | C | Exercise in Earth and Planetary Sciences C | 0-1-0 | 1,4,5 | A,B | a minimum of 1 credit from Exercise in Earth and Planetary Sciences C and D |
| | | EPS.E474.C | ○ ★ | C | Exercise in Earth and Planetary Sciences D | 0-1-0 | 1,4,5 | A,B | |
| | 500 level | EPS.E571.D | ○ ★ | D | Exercise in Earth and Planetary Sciences E | 0-1-0 | 1,4,5 | A,B | a minimum of 1 credit from Exercise in Earth and Planetary Sciences E and F |
| | | EPS.E572.D | ○ ★ | D | Exercise in Earth and Planetary Sciences F | 0-1-0 | 1,4,5 | A,B | |
| | | EPS.E573.E | ○ ★ | E | Exercise in Earth and Planetary Sciences G | 0-1-0 | 1,4,5 | A,B | a minimum of 1 credit from Exercise in Earth and Planetary Sciences G and H |
| | | EPS.E574.E | ○ ★ | E | Exercise in Earth and Planetary Sciences H | 0-1-0 | 1,4,5 | A,B | |
| Major courses | 400 level | EPS.A410.A | ○ ★ | A | Advanced Earth and Space Sciences A | 1-0-0 | 1,2,3,4,5 | A | |
| | | EPS.A411.A | ○ ★ | A | Advanced Earth and Space Sciences B | 1-0-0 | 1 | A | |
| | | EPS.A413.A | ○ ★ | A | Advanced Earth and Space Sciences C | 1-0-0 | 1,5 | A | |
| | | EPS.A418.A | ○ ★ | A | Advanced Earth and Space Sciences E | 1-0-0 | 1,2,3 | A | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | EPS.A420.A | ○<br>★ | A | Advanced Earth and Space Sciences F | 1-0-0 | 1 | A | |
| | | EPS.A421.A | ○<br>★ | A | Advanced Earth and Space Sciences G | 1-0-0 | 1 | A | |
| | | EPS.A422.A | ○<br>★ | A | Advanced Earth and Space Sciences D | 1-0-0 | 1 | A | |
| | | EPS.A424.A | ○<br>★ | A | Advanced Earth and Space Sciences H | 1-0-0 | 1,5 | A | |
| | | EPS.A426.A | ○<br>★ | A | Advanced Earth and Space Sciences I | 1-0-0 | 1 | A | |
| | | EPS.A427.A | ○<br>★ | A | Advanced Earth and Space Sciences J | 1-0-0 | 1 | A | |
| | | EPS.A428.A | ○<br>★ | A | Advanced Earth and Space Sciences K | 1-0-0 | 1 | A | |
| | | EPS.A429.A | ○<br>★ | A | Advanced Earth and Space Sciences L | 1-0-0 | 1 | A | |
| | | EPS.A461.A | ○<br>★ | A | Earth–Life Science A | 2-0-0 | 1,2,4 | A | Earth–Life Science (ELS.C401.E) |
| | | EPS.A462.A | ○<br>★ | A | Earth–Life Science B | 2-0-0 | 1,2,4 | A | Earth–Life Science (ELS.C402.E) |
| | | EPS.A463.A | ○<br>★ | A | Earth–Life Science C | 2-0-0 | 1,2,4 | A | Earth–Life Science (ELS.C403.E) |
| | | EPS.A451.A | ○ | A | Special Lecture in Earth and Planetary Sciences AI | 2-0-0 | 1 | A | |
| | | EPS.A452.A | ○ | A | Special Lecture in Earth and Planetary Sciences BI | 1-0-0 | 1 | A | |
| | | EPS.A453.A | ○ | A | Special Lecture in Earth and Planetary Sciences CI | 1-0-0 | 1 | A | |
| | | EPS.A454.A | ○ | A | Special Lecture in Earth and Planetary Sciences DI | 1-0-0 | 1 | A | |
| | | EPS.A455.A | ○ | A | Special Lecture in Earth and Planetary Sciences AII | 1-0-0 | 1 | A | |
| | | EPS.A456.A | ○ | A | Special Lecture in Earth and Planetary Sciences BII | 1-0-0 | 1 | A | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | EPS.A457.A | ○<br>★ | A | Special Lecture in Earth and Planetary Sciences CII | 1-0-0 | 1,2,3,4,5 | A | |
| | | EPS.A458.A | ○<br>★ | A | Special Lecture in Earth and Planetary Sciences DII | 1-0-0 | 1,2,3,4,5 | A | |
| | | EPS.C428.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences A | 0-1-0 | 2,3,4 | C | |
| | | EPS.C429.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences B | 0-1-0 | 2,3,4 | C | |
| | | EPS.C430.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences C | 0-1-0 | 2,3,4 | C | |
| | | EPS.C431.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences D | 0-1-0 | 2,3,4 | C | |
| | | EPS.C438.L | ★ | | EPS Career Development A | 0-1-0 | 3,4,5 | C | |
| | | EPS.C439.L | ★ | | EPS Career Development B | 0-1-0 | 3,4,5 | C | |
| | | EPS.C440.L | ★ | | EPS Career Development C | 0-1-0 | 3,4,5 | C | |
| | | EPS.C441.L | ★ | | EPS Career Development D | 0-1-0 | 3,4,5 | C | |
| | | EPS.C458.L | ★ | | EPS Tutorial A | 0-1-0 | 3,4,5 | C | |
| | | EPS.C459.L | ★ | | EPS Tutorial B | 0-1-0 | 3,4,5 | C | |
| | | EPS.C460.L | ★ | | EPS Tutorial C | 0-1-0 | 3,4,5 | C | |
| | | EPS.C461.L | ★ | | EPS Tutorial D | 0-1-0 | 3,4,5 | C | |
| | **500 level** | EPS.A551.A | ○ | A | Special Lecture in Earth and Planetary Sciences EI | 1-0-0 | 1 | A | |
| | | EPS.A552.A | ○ | A | Special Lecture in Earth and Planetary Sciences FI | 1-0-0 | 1 | A | |
| | | EPS.A553.A | ○ | A | Special Lecture in Earth and Planetary Sciences GI | 1-0-0 | 1 | A | |
| | | EPS.A554.A | ○ | A | Special Lecture in Earth and Planetary Sciences HI | 1-0-0 | 1 | A | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | EPS.A555.A | ○ | A | Special Lecture in Earth and Planetary Sciences EII | 1-0-0 | 1 | A | |
| | | EPS.A556.A | ○ | A | Special Lecture in Earth and Planetary Sciences FII | 1-0-0 | 1 | A | |
| | | EPS.A557.A | ○ | A | Special Lecture in Earth and Planetary Sciences GII | 1-0-0 | 1 | A | |
| | | EPS.A558.A | ○ | A | Special Lecture in Earth and Planetary Sciences HII | 1-0-0 | 1 | A | |
| | | EPS.C528.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences E | 0-1-0 | 2,3,4 | C | |
| | | EPS.C529.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences F | 0-1-0 | 2,3,4 | C | |
| | | EPS.C530.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences G | 0-1-0 | 2,3,4 | C | |
| | | EPS.C531.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences H | 0-1-0 | 2,3,4 | C | |
| | | EPS.C538.L | ★ | | EPS Career Development E | 0-1-0 | 3,4,5 | C | |
| | | EPS.C539.L | ★ | | EPS Career Development F | 0-1-0 | 3,4,5 | C | |
| | | EPS.C540.L | ★ | | EPS Career Development G | 0-1-0 | 3,4,5 | C | |
| | | EPS.C541.L | ★ | | EPS Career Development H | 0-1-0 | 3,4,5 | C | |
| | | EPS.C558.L | ★ | | EPS Tutorial E | 0-1-0 | 3,4,5 | C | |
| | | EPS.C559.L | ★ | | EPS Tutorial F | 0-1-0 | 3,4,5 | C | |
| | | EPS.C560.L | ★ | | EPS Tutorial G | 0-1-0 | 3,4,5 | C | |
| | | EPS.C561.L | ★ | | EPS Tutorial H | 0-1-0 | 3,4,5 | C | |

Note：

• ◎：Required course, ○：Restricted elective, ★：Classes 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)

•【 】Course offered by another graduate major

• The character preceding the three digits in the course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D400.R): A (Advanced), C (Career), Z (Research seminars)

## 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 regard 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.

As there are some Entrepreneurship Courses without GAs, please check carefully before registering for them.

However, 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 Earth and Planetary Sciences recognized as equivalent to Entrepreneurship Courses, and Entrepreneurship Courses**

| Course category | Course number | Course title | | | Credits | GA* | Learning goals | Comments |
|---|---|---|---|---|---|---|---|---|
| **Courses that can be counted as Entrepreneurship Courses** | XIP.A401 | | ★ | Special International Practice in Science | 1-0-0 | GA1M | | Common Course of School of Science<br>Outside the Graduate Major in Earth and Planetary Sciences standard curriculum |
| | EPS.C428.L | | ★ | Cutting Edge Topics in Earth and | 0-1-0 | GA1 | C | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ～EPS.C431.L<br>EPS.C528.L<br>～EPS.C531.L | | | Planetary Sciences A～H | | M | | |
| | EPS.C438.L<br>～EPS.C441.L<br>EPS.C538.L<br>～EPS.C541.L | | ★ | EPS Career Development A～H | 0-1-0 | GA0<br>M | C | |
| | EPS.C458.L<br>～EPS.C461.L<br>EPS.C558.L<br>～EPS.C561.L | | ★ | EPS Tutorial A～H | 0-1-0 | GA1<br>M | C | |
| Career Development Courses | EPS.C470.L | | | Master's Recurrent Program 1 of Earth and Planetary Sciences | 0-0-1 | GA0<br>M<br>GA1<br>M | | Entrepreneurship Course offered by the Graduate Major in Earth and Planetary Sciences.<br>(Cannot be counted for Major Courses) |

★ : Classes 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 Tokyo Tech Academy for Leadership (ToTAL), WISE Programs, or Center of Data Science and Artificial Intelligence may offer courses that are recognized as equivalent to Entrepreneurship Courses in addition to those listed as such 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 academy or center that offers the relevant program.

## 8. Overview of Curriculum System

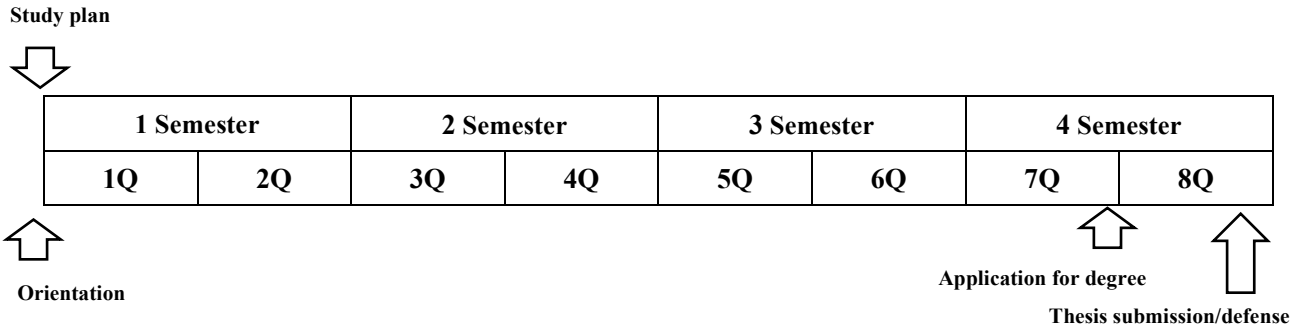
| | 1① | 1② | 1③ | 1④ | 2① | 2② | 2③ | 2④ |
|---|---|---|---|---|---|---|---|---|
| Major courses | Advanced Earth and Space Sciences A | Advanced Earth and Space Sciences B | Advanced Earth and Space Sciences C | Advanced Earth and Space Sciences D | Advanced Earth and Space Sciences A | Advanced Earth and Space Sciences B | Advanced Earth and Space Sciences C | Advanced Earth and Space Sciences D |
| | Advanced Earth and Space Sciences E | Advanced Earth and Space Sciences F | Advanced Earth and Space Sciences G | Advanced Earth and Space Sciences H | Advanced Earth and Space Sciences E | Advanced Earth and Space Sciences F | Advanced Earth and Space Sciences G | Advanced Earth and Space Sciences H |
| | Special Lecture in Earth and Planetary Sciences AI, AII | Special Lecture in Earth and Planetary Sciences BI, BII | Special Lecture in Earth and Planetary Sciences CI, CII | Special Lecture in Earth and Planetary Sciences DI, DII | Special Lecture in Earth and Planetary Sciences EI, EII | Special Lecture in Earth and Planetary Sciences FI, FII | Special Lecture in Earth and Planetary Sciences GI, GII | Special Lecture in Earth and Planetary Sciences FI, FII |
| Reserach-related courses | Exercise in Earth and Planetary Sciences A | Exercise in Earth and Planetary Sciences B | Exercise in Earth and Planetary Sciences C | Exercise in Earth and Planetary Sciences D | Exercise in Earth and Planetary Sciences E | Exercise in Earth and Planetary Sciences F | Exercise in Earth and Planetary Sciences G | Exercise in Earth and Planetary Sciences H |
| Core courses | Seminar in Earth and Planetary Sciences S1 | | Seminar in Earth and Planetary Sciences F1 | | Seminar in Earth and Planetary Sciences S2 | | Seminar in Earth and Planetary Sciences F2 | |
| Career courses | Cutting Edge Topics in Earth and Planetary Sciences A | Cutting Edge Topics in Earth and Planetary Sciences B | Cutting Edge Topics in Earth and Planetary Sciences C | Cutting Edge Topics in Earth and Planetary Sciences D | Cutting Edge Topics in Earth and Planetary Sciences E | Cutting Edge Topics in Earth and Planetary Sciences F | Cutting Edge Topics in Earth and Planetary Sciences G | Cutting Edge Topics in Earth and Planetary Sciences H |
| | EPS Career Development A | EPS Career Development B | EPS Career Development C | EPS Career Development D | EPS Career Development E | EPS Career Development F | EPS Career Development G | EPS Career Development H |
| | EPS Tutorial A | EPS Tutorial B | EPS Tutorial C | EPS Tutorial D | EPS Tutorial E | EPS Tutorial F | EPS Tutorial G | EPS Tutorial H |

## 9. Example of a Standard Curriculum

| | 1① | 1② | 1③ | 1④ | 2① | 2② | 2③ | 2④ |
|---|---|---|---|---|---|---|---|---|
| Major courses | Advanced Earth and Space Sciences A | Advanced Earth and Space Sciences B | Advanced Earth and Space Sciences C | Advanced Earth and Space Sciences D | Classes in other majors | Advanced Earth and Space Sciences F | Advanced Earth and Space Sciences G | |
| Research-related courses | Exercise in Earth and Planetary Sciences A | Exercise in Earth and Planetary Sciences B | Exercise in Earth and Planetary Sciences C | Exercise in Earth and Planetary Sciences D | Exercise in Earth and Planetary Sciences E | | Exercise in Earth and Planetary Sciences G | |
| Core courses | Seminar in Earth and Planetary Sciences S1 | | Seminar in Earth and Planetary Sciences F1 | | Seminar in Earth and Planetary Sciences S2 | | Seminar in Earth and Planetary Sciences F2 | |
| Career courses | | | | EPS Career Development D | | Cutting Edge Topics in Earth and Planetary Sciences F | | |

## 10. Research Related to the Completion of Master's Theses

In the master thesis research, students experience the research process through the small-group specialized instruction in each laboratory promoting cutting-edge research and develop their own skills in problem establishment, problem solving and communication through preparation of theses.




**• The criteria for examination**

Following requirements must be met.

1. On the research content
   The content should be the level that contributes to the progress in relevant research field.
2. On the thesis
   It includes an adequate review of the relevant research field. The relative position of the research in the field needs to be clear.

**• The thesis review procedure**

The review committee consists of at least three faculty members of the earth and planetary sciences course. The final judgment is carried out after reviewing the thesis and the presentation by the candidate. The examination for candidate who enters the PhD course is made by at least five faculty members.

## 11. Seamless Transition Between Degree Programs

The course program is constructed so that students can satisfactorily advance their research from the global point of view based on the basic, advanced, and cutting-edge knowledge that they learned in the master course. The curriculum includes advanced training courses for research presentation and writing of papers, courses for the support of overseas research activities, and those for training for organizing international conferences.

• Deep understanding of earth and planetary sciences acquired by exploring the fundamental laws and principles in the earth and planets.
• Competency to create new knowledge and to transmit it.
• Competency to lead research frontiers in earth and planetary sciences with deep insight and ethical perspective.
• Competency to show international leadership in specialized research fields.

As shown in Table D2, the PhD curriculum provides practical major courses of 600-level as those which support domestic and overseas research activities, bearing internationalization in mind. Advancing major courses of 400- and 500-levels, the PhD curriculum aims to foster researchers who are active in the world.

## 【Doctoral Degree Program】

### 1. Outline

Phenomena covered by earth and planetary sciences are complex combinations of various factors ranging from nano- to tera-scale in space and time. This program provides a variety of learning opportunities to foster human resources challenging and solving such global and planetary-scale problems with scientific thinking and skills.

### 2. Competencies Developed

Students in this program are expected to acquire the following abilities:

- Ability to get insight into the nature of complex phenomena in the earth and planets
- Ability to set a subject of research and to form a research plan
- Ability to build own expertise necessary for research accomplishment
- Ability to present research achievements and take international leadership in an area of expertise

### 3. Learning Goals

Students in this program are expected to study by utilizing the following opportunities to obtain the abilities mentioned above:

A) Intensive courses to learn a wide range of advanced research topics on earth and planetary sciences
B) Laboratory seminars, lectures, and exercise lessons to learn basic and applied research skills
C) Classes to improve English skills and teaching skills and learn carrier development

### 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. Fulfill the requirements in Table D1 below.
3. Pass the doctoral dissertation 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 for courses, students need to fully understand the course goals.

**Table D1. Graduate Major in Earth and Planetary Sciences Completion Requirements**

| Course category | | <Required courses><br>Required credits | <Electives><br>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 | |
| | Entrepreneurship Courses | | 4 credits | | C | All Graduate Attributes (GA) should be acquired. (Refer to Section 7 for the definition of GA.) |
| | Other courses | | | | | |
| Core courses | Research seminars | Seminar in Earth and Planetary Sciences S3<br>Seminar in Earth and Planetary Sciences F3<br>Seminar in Earth and Planetary Sciences S4<br>Seminar in Earth and Planetary Sciences F4<br>Seminar in Earth and Planetary Sciences S5<br>Seminar in Earth and Planetary Sciences F5<br>A total of 12 credits, 2 credits each from the above courses. | | 12 credits | B | |
| | Research-related courses | | | | B | |
| | Major courses | | | | A, C | |
| | Major courses and Research-related courses <u>outside</u> the Graduate Major in Earth and | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Planetary Sciences standard curriculum** | | | | | |
| **Total required credits** | | **A minimum of 24 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.**<br>**・For details of the Liberal Arts and Basic Science Courses, please refer to the relevant sections.** | | | | |

## 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 Earth and Planetary Sciences**

| Course category | | Course number | Course title | | | Credits | Competencies | Learning goals | Comments |
|---|---|---|---|---|---|---|---|---|---|
| Research seminars | 600 level | EPS.Z691.R | ◎ | ★ | Seminar in Earth and Planetary Sciences S3 | 0-2-0 | 1,3 | B | |
| | | EPS.Z692.R | ◎ | ★ | Seminar in Earth and Planetary Sciences F3 | 0-2-0 | 1,3 | B | |
| | | EPS.Z693.R | ◎ | ★ | Seminar in Earth and Planetary Sciences S4 | 0-2-0 | 1,3 | B | |
| | | EPS.Z694.R | ◎ | ★ | Seminar in Earth and Planetary Sciences F4 | 0-2-0 | 1,3 | B | |
| | | EPS.Z695.R | ◎ | ★ | Seminar in Earth and Planetary Sciences S5 | 0-2-0 | 1,3 | B | |
| | | EPS.Z696.R | ◎ | ★ | Seminar in Earth and Planetary Sciences F5 | 0-2-0 | 1,3 | B | |
| Research-related courses | 600 level | EPS.E671.L | ★ | | Exercise in Earth and Planetary Sciences I | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E672.L | ★ | | Exercise in Earth and Planetary Sciences J | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E673.L | ★ | | Exercise in Earth and Planetary Sciences K | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E674.L | ★ | | Exercise in Earth and Planetary Sciences L | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E675.L | ★ | | Exercise in Earth and Planetary Sciences | 0-1-0 | 1,4,5 | A, B | |

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| | | | | | M | | | | |
| | | EPS.E676.L | ★ | | Exercise in Earth and Planetary Sciences N | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E677.L | ★ | | Exercise in Earth and Planetary Sciences O | 0-1-0 | 1,4,5 | A, B | |
| | | EPS.E678.L | ★ | | Exercise in Earth and Planetary Sciences P | 0-1-0 | 1,4,5 | A, B | |
| **Major courses** | **600 level** | EPS.A651.L | | | Special Lecture in Earth and Planetary Sciences I | 1-0-0 | 1 | A | |
| | | EPS.A652.L | | | Special Lecture in Earth and Planetary Sciences J | 1-0-0 | 1 | A | |
| | | EPS.A653.L | | | Special Lecture in Earth and Planetary Sciences K | 1-0-0 | 1 | A | |
| | | EPS.A654.L | | | Special Lecture in Earth and Planetary Sciences L | 1-0-0 | 1 | A | |
| | | EPS.A655.L | | | Special Lecture in Earth and Planetary Sciences M | 1-0-0 | 1 | A | |
| | | EPS.A656.L | | | Special Lecture in Earth and Planetary Sciences N | 1-0-0 | 1 | A | |
| | | EPS.A657.L | | | Special Lecture in Earth and Planetary Sciences O | 1-0-0 | 1 | A | |
| | | EPS.A658.L | ★ | | Special Lecture in Earth and Planetary Sciences P | 1-0-0 | 1 | A | |
| | | EPS.C628.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences I | 0-1-0 | 2,3,4 | C | |
| | | EPS.C629.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences J | 0-1-0 | 2,3,4 | C | |
| | | EPS.C630.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences K | 0-1-0 | 2,3,4 | C | |
| | | EPS.C631.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences L | 0-1-0 | 2,3,4 | C | |
| | | EPS.C632.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences M | 0-1-0 | 2,3,4 | C | |
| | | EPS.C633.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences N | 0-1-0 | 2,3,4 | C | |
| | | EPS.C634.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences O | 0-1-0 | 2,3,4 | C | |
| | | EPS.C635.L | ★ | | Cutting Edge Topics in Earth and Planetary Sciences P | 0-1-0 | 2,3,4 | C | |
| | | EPS.C638.L | ★ | | EPS Career Development I | 0-1-0 | 3,4,5 | C | |
| | | EPS.C639.L | ★ | | EPS Career Development J | 0-1-0 | 3,4,5 | C | |
| | | EPS.C640.L | ★ | | EPS Career Development K | 0-1-0 | 3,4,5 | C | |

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| | | EPS.C641.L | ★ | | EPS Career Development L | 0-1-0 | 3,4,5 | C | |
| | | EPS.C642.L | ★ | | EPS Career Development M | 0-1-0 | 3,4,5 | C | |
| | | EPS.C643.L | ★ | | EPS Career Development N | 0-1-0 | 3,4,5 | C | |
| | | EPS.C644.L | ★ | | EPS Career Development O | 0-1-0 | 3,4,5 | C | |
| | | EPS.C645.L | ★ | | EPS Career Development P | 0-1-0 | 3,4,5 | C | |
| | | EPS.C658.L | ★ | | EPS Tutorial I | 0-1-0 | 3,4,5 | C | |
| | | EPS.C659.L | ★ | | EPS Tutorial J | 0-1-0 | 3,4,5 | C | |
| | | EPS.C660.L | ★ | | EPS Tutorial K | 0-1-0 | 3,4,5 | C | |
| | | EPS.C661.L | ★ | | EPS Tutorial L | 0-1-0 | 3,4,5 | C | |
| | | EPS.C662.L | ★ | | EPS Tutorial M | 0-1-0 | 3,4,5 | C | |
| | | EPS.C663.L | ★ | | EPS Tutorial N | 0-1-0 | 3,4,5 | C | |
| | | EPS.C664.L | ★ | | EPS Tutorial O | 0-1-0 | 3,4,5 | C | |
| | | EPS.C665.L | ★ | | EPS Tutorial P | 0-1-0 | 3,4,5 | C | |
| | | EPS.C680.L | | | Cooperative Education through Research Internships of (Earth and Planetary Sciences) | 0-0-4 | GA1D | C | |

Note：

• ◎：Required course，○：Restricted elective，O：odd academic years，E：even academic years，★：Classes 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 course number denotes the course's subdiscipline (i.e., "D" represents the subdiscipline code in the course number ABC.D600.R): A (advanced), C (career)

## 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 regard 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.

As there are some Entrepreneurship Courses without GAs, please check carefully before registering for them.

However, 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 Earth and Planetary Sciences recognized as equivalent to Entrepreneurship Courses**

| Course category | Course number | Course title | | | Credits | GA* | Learning goals | Comments |
|---|---|---|---|---|---|---|---|---|
| **Courses that can be counted as Entrepreneurship Courses** | XIP.A601 | | ★ | Advanced International Practice in Science | 1-0-0 | GA1D | | Common Course of School of Science<br>Outside the Graduate Major in Earth and Planetary Sciences standard curriculum |
| | EPS.C628.L ～ EPS.C635.L | | ★ | Cutting Edge Topics in Earth and Planetary Sciences I～P | 0-1-0 | GA1D | C | |
| | EPS.C638.L ～ EPS.C645.L | | ★ | EPS Career Development I～P | 0-1-0 | GA0D, GA1D | C | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | EPS.C658.L<br>～<br>EPS.C665.L | | ★ | EPS Tutorial I～P | 0-1-0 | GA1D | C | |
| **Entrepreneurship Courses** | EPS.C670.L | | | Doctoral Recurrent Program 2 of Earth and Planetary Sciences | 0-0-2 | GA0D<br>GA1D | | Entrepreneurship Course offered by the Graduate Major in Earth and Planetary Sciences.<br>(Cannot be counted for Major Courses) |
| | EPS.C680.L | | | Cooperative Education through Research Internships of (Earth and Planetary Sciences) | 0-0-4 | GA1D | C | Entrepreneurship Course offered by the Graduate Major in Earth and Planetary Sciences.<br>(Cannot be counted for Major Courses) |

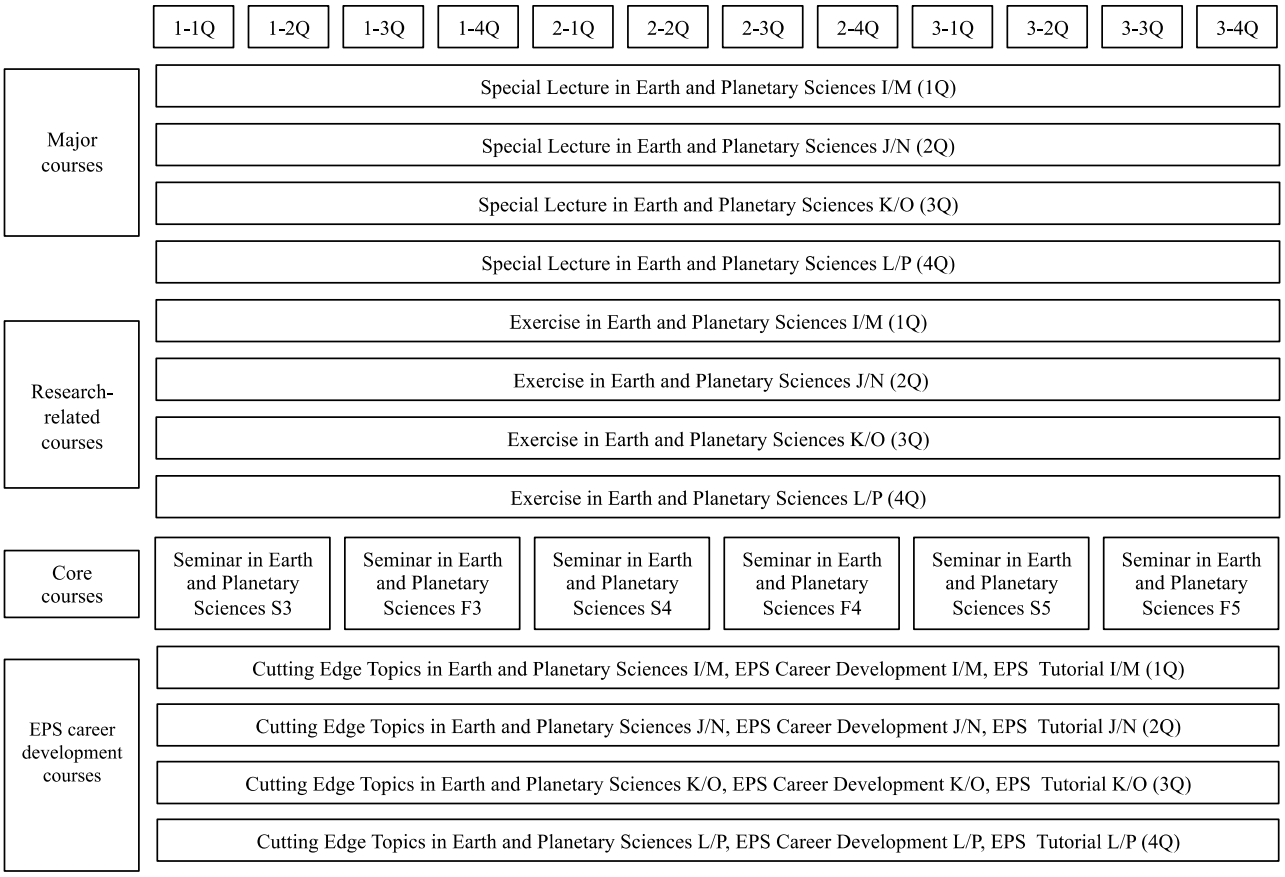
★：Classes in English

**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.**

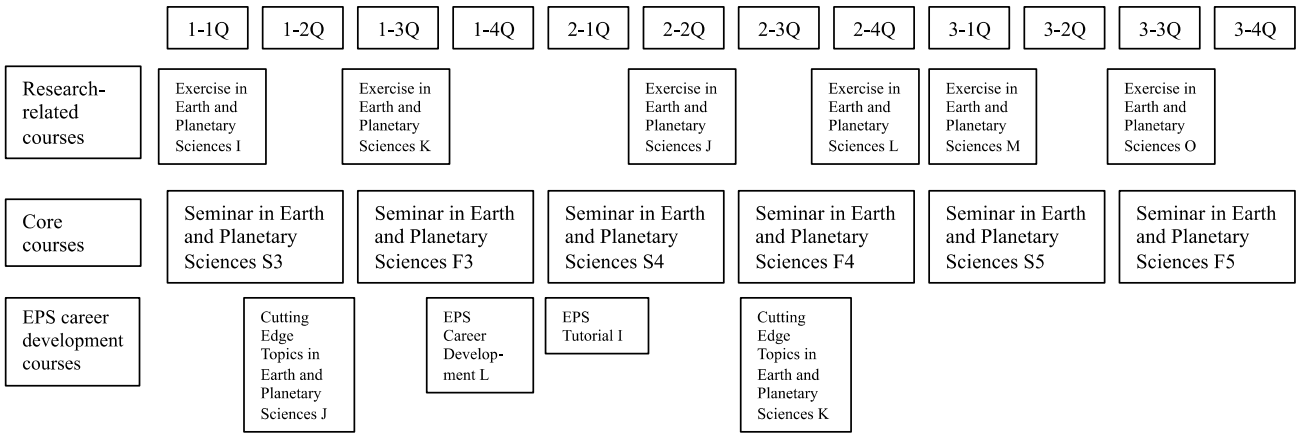
**＊GA: Graduate Attributes**

The Tokyo Tech Academy for Leadership (ToTAL), WISE Programs, or Center of Data Science and Artificial Intelligence may offer courses that are recognized as equivalent to Entrepreneurship Courses in addition to those listed as such 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 academy or center that offers the relevant program.

## 8. Overview of Curriculum System

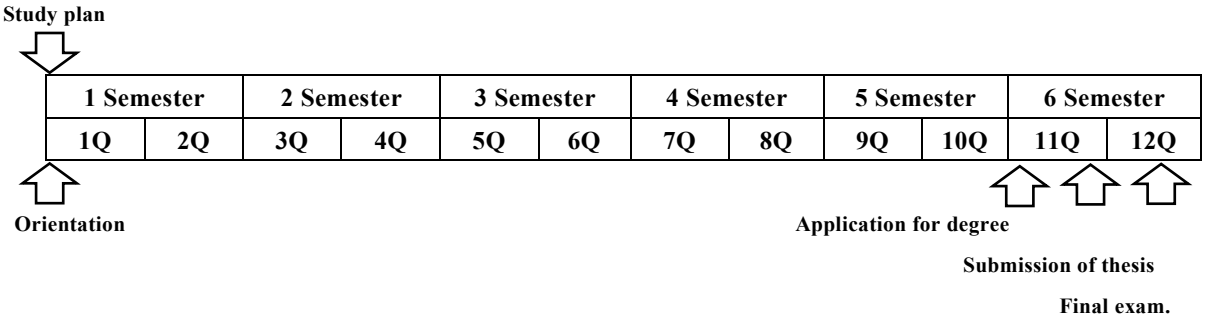



## 9. Example of a Standard Curriculum



## 10. Research Related to the Completion of Doctoral Theses

Through the doctoral thesis research, the candidate must develop the abilities for pointing out the issues to be solved, analyzing the situations, and proposing the solution. At the same time, communication skills in English are also gained to publish research results in international journals.




The following requirements must be met for the qualification

- The thesis should be original and is confirmed to be the world level of research that will contribute to the development of the field of earth and planetary sciences.
- At least one research paper, in which the candidate has a major contribution, is published or accepted in a refereed international journal.
- The candidate must have English ability to promote international collaborations.

<u>The thesis review procedure</u>

Preliminary evaluations of the submitted thesis are carried out based on a hearing of the thesis presentation and the contents of the thesis. When the thesis passes the preliminary screening, the candidate submits a complete version of the thesis to the review committee. After the thesis presentation by the candidate, the thesis is reviewed by the committee and the final exam follows. The review committee consists of at least five faculty members in the Earth and Planetary Sciences course.