

### Specifications for Major Program

Name of School (Program) [School of Science (Department of Earth and Planetary Systems Science)]

Program name (Japanese)	地球惑星システム学プログラム
(English)	Earth and Planetary Systems Science

1. Degree to be obtained: Bachelor of Science

2. Overview

The School of Science at Hiroshima University aims to educate students to steadily learn the basics of natural science, and to foster acute sensitivity for exploring truth, in order to provide professionals with an integrated ability to make judgments based on broad and deep intelligence.

The Earth and Planetary Systems Science Program aims to provide people of talent who have their intellectual base in earth and planetary science and are capable of working as (1) researchers, (2) engineers, and (3) educators in various fields in society. For example, students are expected to become (1) faculty members at a college or researchers in another research institute, (2) civil engineering consultants and engineers in a company related to natural resources, energy, disaster prevention, and information technology, and (3) science teachers in junior and/or senior high schools. In order to educate students to acquire knowledge, specialized skills, and analytic capabilities that cover the wide field of earth and planetary science, and to provide subjects that meet the various interests and characteristics of each student, the program consists of field exercises and graduation research in addition to lectures, practices, and exercises provided as indoor classes.

In this program, students study, from the basics to the application, three categories of subjects required for advanced research in earth and planetary systems science, i.e. (1) minerals, rocks, and geology; (2) the solar system, the earth, and the emergence and evolution of life; and (3) the motion mechanisms and internal structure of the solid part of the earth and planets. This program is composed as a bottom-up process that works on a year by year basis to enable students to study earth and planetary science from its basics and finally become capable of the application and practice required for state-of-the-art research.

3. Diploma policy (policy for awarding degrees and goal of the program)

This program aims to educate students to become people of talent who can work actively, with an international point of view, as researchers, engineers, and educators in fields related to earth and planetary systems science, in which various areas of earth and planetary science are amalgamated. This program will award the degree bachelor of science to students who have acquired the capabilities described below and earned the required credits defined for the educational course:

- The basic knowledge of mathematics, physics, chemistry, biology, and earth and planetary science required for studying a wide variety of areas of earth and planetary systems science;
- The basic skills in English and information processing required for studying 0 Gurh iious 1( of)3( ar) re-7r of etud

planetary systems science;

- The capability for reading academic documents related to earth and planetary science in Japanese and English, and understanding and examining structures and phenomena from the microscopic to the macroscopic level; and
- The capability for performing specialized research related to earth and planetary systems science, organizing the results into a thesis, and presenting it in English.

#### 4. Curriculum policy (policy for organizing and implementing the curriculum)

This program has been designed to educate students through the study, first of all, of the wide range of basics in earth and planetary systems science that form a fusion of the various areas of the field, before advancing to further specialized areas.

- In the first year, students study subjects to learn a wide range of the basics of mathematics, physics, chemistry, biology, and earth and planetary science in liberal arts education and specialized education. In addition to this, they learn foreign languages, mainly English, and the basics of information processing, in order to acquire the fundamental skills required for studying earth and planetary science. Students also acquire basic knowledge related to geology in liberal arts seminars and field excursions.
- In the second year, in specialized education, students study the basics of geology, physics of earth and planetary interiors, and geo- and cosmochemistry, in order to acquire basic capabilities required for the specialized study of a variety of areas in earth and planetary systems science. Students also acquire skills in basic English that can be immediately useful for specialized areas in the classes that are specifically designed for earth and planetary science. The field excursion is conducted in a different location to that of the first year, to enhance students' knowledge of geology.
- In the third year, students enhance their knowledge and skills in specialized areas through lectures and exercises mainly related to elective subjects for specialized education. Students also acquire skills in intermediate English that can be immediately useful for specialized areas in the classes that are specifically designed for earth and planetary science. They conduct geological surveys and indoor experiments as practice in order to acquire the practical capabilities required for research activities such as observation in the field, data processing, report preparation, and presentation.
- In the fourth year, students are allocated to a laboratory to conduct graduation research on their own topics. They acquire knowledge and skills related to specialized areas through their activities in the laboratory, and develop communication and presentation abilities in seminars and presentation practice.

Academic achievement is evaluated based on grade scores for the subjects, and the level of achievement against the target defined for this program.

#### 5. Start time and acceptance conditions

Students of the Department of Earth and Planetary Science choose this program when they enter our university. There is no problem even if the student did not take a course in geoscience at high school, since the program is designed to allow the student to study earth and planetary systems science from the basics to specialized knowledge in a step-by-step process, starting upon entering the university.

The curriculum is composed with the expectation that students have studied mathematics, physics and chemistry at high school, and they are required to take the specified fundamental subjects in mathematics, physics and chemistry in

their first and second years to understand basics of those subjects.

Requirements for when a student in a department other than the Department of Earth and Planetary Systems Science chooses this program are separately stipulated based on the provisions regarding transfer between schools/departments.

6. Obtainable qualifications

1: Educational personnel certification

(1) Type 1 License for Junior High School Teacher (Science)

(2) Type 1 License for High School Teacher (Science)

2: Curator license

3: Assistant registered surveyor

7. Class subjects and their contents

\* For the class subjects, refer to the subject table in Attachment 1.

\* For the details of the class subjects, refer to the syllabus that is published for each academic year.

8. Academic achievement

The evaluation criteria are specified for each evaluation item for academic achievement, and the level of achievement against the criteria is designated at the end of the semester.

The evaluation score for each evaluation item is converted to a numerical value (S = 4, A = 3, B = 2, and C = 1) and the evaluation standard for academic achievement, from when the student entered the university to the end of the last semester, is determined using these values while applying weightings. The evaluation standards consist of three levels, i.e. Excellent, Very Good, and Good.

Evaluation of academic achievement	Converted value
S (90 or more points)	4
A (80 - 89 points)	3
B (70 - 79 points)	2
C (60 - 69 points)	1

Academic achievement	Evaluation criteria
Excellent	3.00 - 4.00
Very Good	2.00 - 2.99
Good	1.00 - 1.99

\* Refer to the relationship between evaluation items and evaluation criteria described in Attachment 2.

\* Refer to the relationship between evaluation items and class subjects described in Attachment 3.

\* Refer to the curriculum map in Attachment 4.

9. Graduation thesis (graduation research) (meaning, student allocation, timing, etc.)

1. Meaning

To demonstrate achievement in the bachelor's course as a whole.

2. Timing of student allocation

At the beginning of the fourth academic year. To be allocated to a laboratory, students must satisfy the "Conditions for Starting Graduation Research." For the details, refer to Study Guidance for the Earth and Planetary Science Program in the "Students Handbook" (received when the student enters the university).

### 3. Method of student allocation

If the number of students who wish to be allocated to each member of faculty varies significantly, the faculty member to which students are allocated for graduation research is determined based on their academic score at the end of the third academic year.

## 10. Responsibility

### (1) Responsibility for PDCA (plan, do, check, and act) cycle

If the number of students who wish to be allocated to each member of faculty varies significantly, the faculty member to which students are allocated for graduation research is determined based on their academic score at the end of the third academic year.

Liberal Arts Education Subjects	Common Subjects	Peace Science Courses	2	From "Peace Science Courses"	Each 2	Elective/required	○					
		Introduction to University Education	2	Introduction to University Education	2	Required	②					
		Introductory Seminar for First-Year Students	2	Introductory Seminar for First-Year Students	2	Required	②					
		Area Courses	Advanced Seminar			1	Free elective	○	○			
			From "Area Courses" (Note 3)			1or2	Elective/required	○	○	○	○	
			Basic English Usage I			1		①				
			Basic English Usage II			1			①			
			Communication IA			1		①				
			Communication IB			1		①				
			Communication IIA			1			①			
			Communication IIB			1			①			
			Foreign Languages: Basic Studies I			1	Elective/required	○				
			Foreign Languages: Basic Studies II			1	Elective/required	○				
		Social Cooperation Courses (Note 7)	Introduction to Information and Data Sciences	2	Introduction to Information and Data Sciences	2	Required	②				
			Starting Programming from Scratch			2			○			
			Fundamental Date Science			2			○			
			From "Health and Sports Courses"			1or2	Free elective	○	○			
			From "Social Cooperation Courses"	(0)		1or2	Free elective	○	○			
			Calculus I			2		○				
			Calculus II			2			○			
			Linear Algebra I	4		2		○				
			Linear Algebra II			2			○			
			Foundation Courses	Experimental Methods and Laboratory Work in Physics I			1			○		
		Experimental Methods and Laboratory Work in Physics II				1			○			
		Experimental Methods and Laboratory Work in Chemistry I				1				○		
		Experimental Methods and Laboratory Work in Chemistry II				1				○		
		Experimental Methods and Laboratory Work in Biology I				1			○			
		Experimental Methods and Laboratory Work in Biology II				1			○			
Experimental Methods and Laboratory Work in Earth Sciences I				1		○						
Experimental Methods and Laboratory Work in Earth Sciences II				1		○						
Total (Liberal Arts Education Subjects)	34											

(Note 1) The indicated semester represents that in which students typically take the subject. It is permitted to take the subject in the same (first or second) semester in the following year, however, it is required to confirm the details in syllabus for that academic year, because the subject might be provided in a different semester or term.

(Note 3)

(Note 4) You can transfer the credits acquired by completing courses of self-learning "Online English Seminar I, II, III" are accepted as the credit for the subject "Communication I and II". Excessive number of credits earned in the "Area Courses" and "Social Cooperation Courses" in which the language of instruction is in English is accepted as credits for the graduation requirement for English language courses.

(Note 7) The credit for "Social Cooperation Courses" is accepted as credit for the category of "Any subject".

(Note 9) To attend the subject "Special Study for Graduation", it is required to earn 108 or more credits of the 128 credits required for graduation, including "Practice of Earth and Planetary Systems Science A (Field Work)" and "Practice of Earth and Planetary Systems Science B (Experimental Study)".

(Note 10) The class of the subject "Surveying" is provided biannually.

(Note 11) The classes of the subjects of Earth and Planetary Systems Science are provided as follows:

(Note 12) Because 128 credits are required for graduation, it is required to earn 10 or more credits regardless of the categorization of Liberal Arts Education Subjects and Specialized Education Subjects, in addition to the required credits for each subject category (118 credits in total that consist of 34 credits for Liberal Arts Education Subjects and 84 credits for Specialized Education Subjects).

However, the credit for the subjects described below is not accepted as the required credit for graduation: For the details of subjects related to educational personnel certification, refer to the list of required credits in "Acquisition of Educational Personnel Certification" in the Student Handbook.

- Any credit that exceeds 8 credits for "Area Courses"
- Any credit for subjects only related to educational personnel certification
- Credits for "Experiments in General Physics A", "Experiments in Chemistry A", "Laboratory Work in Biology A" and "Experiments in General Geology A"
- "Basic Specialized Subjects" and "Specialized Subjects" provided in another program in another school (except those that are admitted by the faculty committee of Earth and Planetary Systems Science Program)

Introduction to Physics A	2	②	
Introduction to Chemistry A	2	②	
Introduction to Biological Sciences A	2	②	
Introduction to Earth and Planetary Sciences A	2	②	
Field Excursion for Earth Science A	1	①	
Tectonics of the Earth	2		②
Introduction to Earth and Planetary Sciences B	2		②
Basics of Earth and Planetary Materials Science	2		②
Geologic Mapping	2		②
English for Earth and Planetary Sciences I	2		②
Introduction to Mathematics	2	○	
Introduction to Information Mathematics	2		○
Introduction to Physics B	2		○
Introduction to Chemistry B	2		○
Introduction to Biological Sciences B	2		○
Sedimentology and Paleontology I	2		②
Physics of Earth and Planetary Interiors I	2		②
Solid Geochemistry I	2		②
Optical crystallography laboratory	1		①
Practice for Basics of Earth and Planetary Materials Science	1		①
Physics of Earth and Planetary Interiors II	2		②
Earth and Planetary Materials Science	2		②
Petrology	2		②
Petrology laboratory	1		①
Practice for Earth and Planetary Materials Science I	1		①
Field Excursion for Earth Science B	1		①
English for Earth and Planetary Sciences II	2		②
Practice of Earth and Planetary Systems Science A (Field Work)	4		④
Practice of Earth and Planetary Systems Science B (Experimental Study)	2		②
Special Study for Graduation (Note 9)	Each		














Academic achievements Evaluation items		1st grade		2nd grade		3rd grade		4th grade		
		Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	
Abilities and Skills	To acquire the ability to apply and develop the basic knowledge of earth and planetary science by organizing it.			Geochemistry and Geophysics Internship(O)		Material evolution in the solar system(O) Surveying(O)	Cosmochemistry and Geochemistry(O) Advanced Earth and Planetary Science(O)			
	Reading related papers and acquiring the ability of understanding the contents. Reading related papers and acquiring the ability of understanding the contents. Verbal or written regular/daily communication can be carried out using foreign languages. Understand different languages and cultures by using multiple foreign languages.	Basic English Usage I (◎)	Basic English Usage II (◎)		English for Earth and Planetary Sciences I(◎)	English for Earth and Planetary Sciences II(◎)				
		Communication I A(◎)	Communication II A(◎)							
		Communication I B(◎)	Communication II B(◎)							
		Foreign Languages: Basic Studies I (△) Foreign Languages: Basic Studies II (△)								
	Being able to understand, learn and explain logical framework and system of basic studying according to each subject and necessary knowledge and skills for constructing learning.	Introduction to Physics A(◎)	Introduction to Earth and Planetary Sciences B(◎)	Experimental Methods and Laboratory Work in Chemistry I (O)	English for Earth and Planetary Sciences I(◎)	Advanced Mathematics (O)	Advanced Chemistry(O)			
		Introduction to Chemistry A(◎)	Introduction to Information Mathematics (O)	Experimental Methods and Laboratory Work in Chemistry II (O)	Advanced Physics (O)	Advanced Biology (O)	Advanced Earth and Planetary Science(O)			
		Introduction to Biological Sciences A(◎)	Introduction to Physics B(O)							
		Introduction to Earth and Planetary Sciences A(◎)	Introduction to Chemistry B(O)							
		Introduction to Mathematics (O)	Introduction to Biological Sciences B(O)							
Calculus I(O)		Calculus II(O)								
Linear Algebra I(O)		Linear Algebra II(O)								
Experimental Methods and Laboratory Work in Earth Sciences I (O) Experimental Methods and Laboratory Work in Earth Sciences II (O)		Experimental Methods and Laboratory Work in Physics I (O) Experimental Methods and Laboratory Work in Physics II (O)								
Learn field research method and acquire results and acquire ability of making a presentation	Field Excursion for Earth Science A(◎)			Field Excursion for Earth Science B(◎)	Practice of Earth and Planetary Systems Science A (Field Work)(◎) Practice of Earth and Planetary Systems Science B (Field Work)(◎)					
					Practice of Earth and Planetary Systems Science A (Field Work)(◎) Practice of Earth and Planetary Systems Science B (Field Work)(◎)					
To be able to learn to practice methods of presenting, collecting, examining, and analyzing geosciences data.										
To understand and explain the moral and social issues needed to utilize information. Also, to learn basic knowledge, skills, and attitudes pertaining to information.	Introduction to Information and Data Sciences(◎)	Starting Programming from Scratch(O) Fundamental Date Science(O)								
To be able to scientifically explain the need for fitness and health promotion. Also, through practice of sports, to be able to understand and explain the significance of practicing sports for life and the importance of an appropriate attitude and sense of collaboration.	Health and Sports Courses(△)	Health and Sports Courses(△)								
Comprehensive Abilities	Acquire the ability and skills of setting team themes.							Special Study for Graduation (◎)	Special Study for Graduation (◎)	
	Learning the ability ·skills to plan and carry out research plans.							Special Study for Graduation (◎)	Special Study for Graduation (◎)	
	Having acquiring the ability ·skills to compile research results and make the presentation.							Special Study for Graduation (◎)	Special Study for Graduation (◎)	

Liberal Arts Education Subjects Basic Specialized Subjects Specialized Education Subjects Graduation Thesis (◎)Required (O)Elective/required (△)Free elective