For entrants in AY 2023

Appended Form 1

Specifications for Major Program

Name of School (Program) [School of Science (Department of Mathematics)〕

Program name (Japanese)	数学プログラム
(English)	Mathematics

1. Degree to be obtained: Bachelor of Science

2. Overview

Among the fields of science, mathematics is the subject for which standardization and systematization are the most advanced. The Mathematics Program at Hiroshima University mainly aims to educate students to understand and rigorously learn the essence of basic theories in the fields of modern mathematics such as algebra, geometry, and analysis. Through this process, students develop an in-depth ability to comprehend complex phenomena from a mathematical point of view in order to generalize, abstract, systematize, and model these phenomena. Students are also enabled to improve their abilities in logical thinking and representation in order to establish a foundation for their future. The abilities described above are required for identifying, formulating, and solving the various problems that appear in all areas of society. We also aim to educate students through carefully supervised independent study in order to produce professionals who are capable of making autonomous decisions based on concrete evidence and able to work in various fields while adapting to change and newly-emerging factors. We hope to create researchers who will contribute to the evolution of mathematical science in the future, educators who understand the essence and academic meaning of modern science, and professionals who have sophisticated mathematical thinking abilities and the creativity required to meet the needs of an information-intensive society. Mastery of basic academic skills and advanced knowledge is expected upon completion of the course.

A great deal of importance will be attached to the continuity of education from the undergraduate to the graduate school. Students can advance to the Mathematics Program in the Division of Advanced Science and Engineering in the Graduate School of Advanced Science and Engineering or to the Program of Mathematical and Life Sciences in the Division of Integrated Sciences for Life in the Graduate School of Integrated Sciences for Life.

Subjects are arranged clearly and hierarchically into liberal arts subjects and specialized education subjects (specialized basic subjects and specialized subjects). Globally standardized lessons are provided for specialized basic subjects and specialized subjects in which lectures are supported by exercise sessions. Therefore, achievement in this program is considered to be an achievement of the global standard. In the 3rd year, lessons that enable students to acquire the knowledge and skills required for exploring the cutting edge of the field that they have chosen will be provided. Because of these lessons, students will be able comprehend and enjoy specialized lectures in the Department of Mathematics and benefit from a bachelor's course in which a great deal of importance is given to the continuity of education from the undergraduate school to the graduate school.

Since Mathematics is a common language in the fields of natural science, this program gives consideration to the

fact that students may advance to various fields in science after obtaining their mathematics degree. Specialized fundamental subjects from other programs in the School of Science are accepted as part of the credit required for graduation.

This program also provides courses to meet the requirements of students who wish to obtain certification as Mathematics teachers for junior and senior high school. Furthermore, students who obtain a master's degree are permitted to obtain specialized certification for Mathematics teachers of junior and senior high schools.

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

Based on the aims above, this program will award the degree of Bachelor of Science to students who, in addition to earning the required number of credits, have acquired the capabilities described below:

- The ability to think and make decisions from a wide-ranging perspective
- The ability to understand the essence of basic theories in the various fields of modern mathematics and how to apply those theories
- The ability to think and express oneself logically
- The ability to comprehend various phenomena from a mathematical point of view in order to generalize, abstract, systematize, model, and process them
- The basic skills and advanced knowledge required for advanced study and research in the graduate school or for actively working in various fields such as education and industry.

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

To achieve the targets listed in the diploma policy, this program organizes and implements a curriculum according to the following policies:

- In the first year, students develop a wide range of knowledge in areas such as the humanities, social and natural sciences, information science, peace studies, and foreign languages. In addition to this, students acquire fundamental knowledge and skills through courses such as An Introduction to Mathematics, Linear Algebra and Calculus. Also, focus will be given to obtaining the right attitude for collaborating with others through presentations and discussion in the course Liberal Arts Subject Seminars.
- In the second year, students study the essence of fundamental theories in the various fields of modern mathematics through specialized fundamental subjects related to algebra, analysis, and the fundamental concepts of mathematics. This is done in order to establish basic mathematical capabilities (for conceptual understanding, calculation, and demonstration) and to improve their ability to think logically and express themselves through the exercise courses. In subjects related to topics such as mathematics for computation and probability and statistics, students study processing methods that model and/or systematize various phenomena and analysis methods using computers.
- In the third year, elective subjects that consist of generalized and abstract content in fields such as algebra, geometry, analysis, probability and statistics, and applied mathematics are provided to encourage students to study autonomously and acquire the knowledge required for success at the cutting edge in each field.
- In the fourth year, while taking into consideration the possibility of proceeding to the graduate school, students receive instruction on cutting-edge developments in the field they have chosen in order to improve their ability to

identify and solve problems, think logically, give presentations and be more creative.

Academic achievement is evaluated based on grades/scores and performance.

5. Start time and acceptance conditions

In the School of Science, each department holds entrance examinations and stipulates the requirement for admission to the department in its application guidelines. This program is designed mainly for students of the Department of Mathematics. Students will take this program when they enter our department.

This program also accepts all students who have already been accepted to this university. Requirements for students who wish to join the Department of Mathematics are stipulated separately based on the provisions regarding transfer between schools or departments.

6. Obtainable qualifications

Type 1 license for junior high school Mathematics teachers. Type 1 license for senior high school Mathematics, Curator license, certification for Assistant Registered Surveyors, qualification for joining the Skill Training course for health controllers in Health Engineering.

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 academic achievement item, and the achievement level against these criteria is given at the end of the semester.

The evaluation score for each item is converted to a numerical value (S = 4, A = 3, B = 2, and C = 1), and the evaluation standard for academic achievement from the time the student entered the university to the end of the last semester is determined by using these values. 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. Requirements

Students make a further, deeper study of theories and knowledge in the research area that they have chosen and organize all of the mathematical knowledge they have acquired up to and including the third year. They also learn to explain their understanding and ideas clearly and effectively while answering questions and engaging in discussion with faculty members and other attendees at events, such as colloquiums. In their graduation research, students who are going to advance to the graduate school acquire further specialized understanding that can be of use in their graduate school courses, as well as the abilities and skills required for independent researchers and/or educators. Students must organize and summarize all of their knowledge from the undergraduate school in the process of preparing and presenting their graduation thesis which will be based on their carefully supervised autonomous study and research.

2. Overview

In the Mathematics Program, students carry out their graduation research by taking the class "Special Study of Mathematics and Informatics for Graduation." The content of the graduation research varies widely depending on the faculty member or group. Students get to know the specialty of each mentor in the class "Advanced Mathematics" that is provided in the first semester of the third year. Intensive guidance seminars are held to announce the outline of the graduation research several months before starting the research.

3. Lab assignment, timing and method

1 Students are assigned to a laboratory at the beginning of the fourth academic year. To be assigned to a laboratory, students must be qualified to attend the "Special Study of Mathematics and Informatics for Graduation" class.

2 For qualifications to attend "Special Study of Mathematics and Informatics for Graduation", refer to "Qualifications for Attending Special Study of Mathematics and Informatics for Graduation" described in the Study Guidance for the Mathematics Program section of the "Student Handbook" (given when students enter the university).

10. Responsibility

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

The faculty committee of the Mathematics Program (chief: Chair of the Department of Mathematics) is engaged in the processes of "plan" and "do."

For the processes of "check" and "act", the Chair of the Department of Mathematics consults with the Curriculum Review Committee of the Department of Mathematics and carries out the required actions while taking the results of the consultation into consideration.

The faculty members who constitute the faculty committee for each major program are listed in Attachment 5.

(2) Evaluation of the program

A small-sized consultation meeting with the students of each year is held at the end of the semester to discuss the completed courses. Results of this discussion will be taken into consideration for improving the program.

A booklet entitled "After Completing Lectures" is delivered to faculty members and students after the semester ends to notify them about any updated information concerning course curriculum.

Table of Registration Standards for Mathematics Program (Entrants of 2023)

Refer to Study Guidance for the Mathematics Program for requirements for attending the course.

Students are allowed to take class subjects provided in other programs and schools, and in other universities, in addition to the class subjects listed in this table, and the credit for those subjects that the faculty committee of the Mathematics Program certifies is accepted as the required credit for graduation.

The credit for the subjects "Introduction to Mathematics Education I" and "Introduction to Mathematics Education II" that are provided by the School of Education is counted towards the required credit for graduation (for the subject category of "Specialized Subjects").

When the faculty committee of the Mathematics Program allows it, students can take class subjects before the period defined in the class subject table.

* Students who have earned required credits (refer to the Student Handbook for details) can acquire the type 1 license for junior high school teachers (mathematics), type 1 license for senior high school teachers (mathematics), certification for assistant registered surveyors, and the curator license.

(Liberal Arts Education)

Type	Subject type				Required No. of credits		Class subjects, etc.	No. of credits	Type of course registration	Year in which the subject is taken (*The lower figure means semester) (Note 1)							
										1st grade		2nd grade		3rd grade		4th grade	
										Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
										1	2	3	4	5	6	7	8
Liberal Arts Education Subjects	Peace Science Courses				2		From "Peace Science Courses"	Each 2	Elective/required	○							
	Basic Courses in University Education	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							
		Advanced Seminar (Note 2)			(0)			1	Free elective	○	○						
	Common Subjects	Area Courses			8		From "Area Courses" (Note 3)	1 or 2	Elective/required	○	○	○	○				
		Foreign Languages	English (Note 4) (Note 6)	Basic English Usage (Note 5)	8	(0)	Basic English Usage I	1	Free elective	○							
							Basic English Usage II	1			○						
				Communication I		2	Communication IA	1	Required	①							
							Communication IB	1		①							
				Communication II		2	Communication IIA	1	Required		①						
							Communication IIB	1			①						
			Non-English Foreign Languages (Select one language from German, French, Spanish, Russian, Chinese and Korean) (Note 6)			4	Foreign Languages: Basic Studies I	1	Elective/required	○							
							Foreign Languages: Basic Studies II	1		○							
							Foreign Languages: Basic Studies Ⅲ	1			○						
							Foreign Languages: Basic Studies Ⅳ	1			○						
							Ⅰ, Ⅱ, Ⅲ and Ⅳ must be the same language											
		Information and Data Science Courses			4	2	Introduction to Information and Data Sciences	2	Required	②							
						2	Computer Programming	2	Elective/required	○	○						
							Intelligence and Computer	2			○						
							Starting Programming from Scratch	2			○						
							Fundamental Date Science	2			○						
		Health and Sports Courses			2		From "Health and Sports Courses"	1 or 2	Elective/required	○	○						
		Social Cooperation Courses (Note 7)			(0)		From "Social Cooperation Courses"	1 or 2	Free elective	○	○						
		Foundation Courses			6		Linear Algebra I	2	Required	②							
							Seminar in Linear Algebra I	1		①							
							Linear Algebra Ⅱ	2			②						
							Seminar in Linear Algebra Ⅱ	1			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 2) The credit for "Advanced Seminar" is accepted as credit for the category of "Any subject ".

(Note 3) It is required to earn 4 credits in "Human & Social Science Subjects" and 4 credits in "Natural Science Subjects". Students who want to acquire an educational personnel certification must take the subject "Japanese Constitution" in the "Human & Social Science Subjects".
Credits earned through the subject "Advanced English for Communication", "Foreign Languages: Intensive Studies" and "Overseas Language Seminar (German, French, Spanish, Russian, Chinese, and Korean)" in "Foreign Languages" are accepted as the credits required for "Human & Social Science Subjects".

(Note 4) 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 5) The credit for "Basic English Usage I" and "Basic English Usage II" is accepted as credit for the category of "Any subject".

(Note 6) Credit Approval for Foreign Language Proficiency Tests, etc.: For details, please refer to the sections relating to the English of Liberal Arts Education and "Handling of Credit Approval for Foreign Language Proficiency Tests, etc." in the Student Handbook.

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

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* Note for the "Specialized Education Subjects" listed in the next page and after

(Note 8) To achieve the 54 credits required for the "Specialized Subjects", it is required to earn 26 or more credits for elective required subjects and free elective subjects, as well as 10 credits for required subjects and 18 credits for elective required subjects.
The credit for the subjects "Introduction to Mathematics Education I" and "Introduction to Mathematics Education II" that are provided in School of Education is counted as credit for the "Specialized Subjects."

(Note 9) For the 11 class subjects of "Specialized Subjects", for which lectures and exercises are provided in pairs, it is required to earn 16 or more credits for 4 or more pairs of subjects.

(Note 10) The subject "Algebra E" is provided in the 7th or 8th semester.

(Note 11) The subject "Topics in Mathematics" is provided in the form of such subjects as "Topics in Algebra", "Topics in Geometry", "Topics in Analysis" and "Topics in Probability and Statistics".

(Note12) The classes in "Special Lectures in Mathematics" are provided as an integrated course within a certain period of time (after the 5th semester; mainly after the 7th semester).

(Note 13) Because 128 credits are required for graduation, it is required to earn not only the required credits for each subject category (121 credits in total that consist of 34 credits in Liberal Arts Education Subjects and 87 credits in Specialized Education Subjects), but 128 or more credits in total regardless of the categorization of Liberal Arts Education Subjects and Specialized Education Subjects.
However, the credits for the subjects described below are not accepted as 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 for subjects only related to educational personnel certification, except for "Introduction to Mathematics Education I" and "Introduction to Mathematics Education II"
・"Basic Specialized Subjects" and "Specialized Subjects" provided in the other programs of the School of Science (except those that are admitted by the faculty committee of the Mathematics Program)
・"Basic Specialized Subjects" and "Specialized Subjects" provided by the other programs in other schools (except those that are admitted by the faculty committee of the Mathematics Program)

(Specialized Education)

Type	Subject type	Required No. of credits		Class subjects, etc.	No. of credits	Type of course registration	Year in which the subject is taken (*The lower figure means semester) (Note 1)							
							1st grade		2nd grade		3rd grade		4th grade	
							Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
							1	2	3	4	5	6	7	8
Specialized Education Subjects	Basic Specialized Subjects	33	5	Introduction to Information Mathematics	2	Elective/required		○						
				Introduction to Physics A	2		○							
				Introduction to Physics B	2			○						
				Introduction to Chemistry A	2		○							
				Introduction to Chemistry B	2			○						
				Introduction to Biological Sciences A	2		○							
				Introduction to Biological Sciences B	2			○						
				Introduction to Earth and Planetary Sciences A	2		○							
				Introduction to Earth and Planetary Sciences B	2			○						
				English Seminar on Mathematics	1					○				
			28	Introduction to Mathematics	2	Required	②							
				Analysis I	2		②							
				Exercises in Analysis I	1		①							
				Analysis II	2			②						
				Exercises in Analysis II	1			①						
				Analysis III	2				②					
				Exercises in Analysis III	1				①					
				Analysis IV	2					②				
				Exercises in Analysis IV	1					①				
				Algebra I	2				②					
				Exercises in Algebra I	1				①					
				Algebra II	2					②				
				Exercises in Algebra II	1					①				
				Fundamental Concepts of Mathematics I	2				②					
				Exercises in Fundamental Concepts of Mathematics I	1				①					
				Fundamental Concepts of Mathematics II	2					②				
				Exercises in Fundamental Concepts of Mathematics II	1					①				
				Exercises in Mathematical Software	2				②					
	Specialized Subjects	54 (Note 8)	10	Special Study of Mathematics and Informatics for Graduation	Each 5	Required							⑤	⑤
			2 or more	Advanced Mathematics	2	Elective/required						○		
				Advanced Physics	2					○				
				Advanced Chemistry	2							○		
				Advanced Biology	2						○			
				Advanced Earth and Planetary Science	2							○		
				At least 1 subject (2credits) from the five subjects above										
			16 or more credits for 4 or more pairs of subjects (Note 9)	Algebra A	2	Elective/required					○			
				Exercises in Algebra A	2						○			
				Algebra B	2							○		
				Exercises in Algebra B	2							○		
				Geometry A	2						○			
				Exercises in Geometry A	2						○			
				Geometry B	2							○		
				Exercises in Geometry B	2							○		
				Analysis A	2						○			
				Exercises in Analysis A	2						○			
				Analysis B	2						○			
				Exercises in Analysis B	2						○			
				Analysis C	2							○		
				Exercises in Analysis C	2							○		
				Analysis D	2							○		
				Exercises in Analysis D	2							○		
				Mathematics for Computation	2					○				
				Exercises in Mathematics for Computation	2					○				
				Mathematics for Computation A	2						○			
				Exercises in Mathematics for Computation A	2						○			
				Probability and Mathematical Statistics A	2						○			
				Exercises in Probability and Mathematical Statistics A	2						○			
				Algebra C	2	Free elective							○	
				Algebra D	2									○
				Geometry C	2								○	
				Geometry D	2									○
				Elementary Nonlinear Studies	2							○		
				Mathematical Analysis A	2								○	
				Mathematical Analysis B	2									○
				Probability and Mathematical Statistics B	2							○		
				Probability and Mathematical Statistics C	2									○
				Data Science	2					○				
				Algebra E (Note 10)	2								○	○
				Mathematics for Modeling and Simulation	2							○		
				Theory of Complex Systems	2								○	
				Mathematics for Computation B	2									○
				Mathematics Internship	1						○			
				"Topics in Mathematics" (Note 11)	Each 2								○	○
				"Special Lectures in Mathematics" (Note 12)							○	○	○	○
				"Basic Specialized Subjects" offered by other programs of School of Science that the faculty committee of the Mathematics Program certifies			○	○	○	○	○	○		
				"Specialized Subjects" offered by other programs of School of Science that the faculty committee of the Mathematics Program certifies					○	○	○	○	○	○
	Total(Specialized Education Subjects)	87												
Any subject		(Note 13)					○	○	○	○	○	○	○	○
Total		128												

Academic achievements of Mathmatics Program

Relationships between the evaluation items and evaluation criteria

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	Understanding classical basic theory which is a base of modern mathematics. Being able to find and explain issues from specific events.	Having superb understanding on classical basic theory of modern mathematics. Being able to find and explain issues from specific events to the superb level.	Having well understanding on classical basic theory of modern mathematics. Being able to find and explain issues from specific events to the high level.	Understanding classical basic theory of modern mathematics. Being able to find and explain issues from specific events.
	(2)	Understanding on primary theory of modern mathematics established on classical theory.	Having a very superb level of understanding on primary theory of modern mathematics established on classical theory.	Having a superb level of understanding on primary theory of modern mathematics established on classical theory.	Having a certain level of understanding on primary theory of modern mathematics established on classical theory.
	(3)	Acquiring knowledge and vision on advanced theories as an extension of core theory of modern mathematics.	Having very advanced knowledge on advanced theory of modern mathematics and being able to have a vision with very wide eyesight.	Having advanced knowledge on advanced theory of modern mathematics and being able to have a vision with wide eyesight.	Having a certain knowledge on advanced theory of modern mathematics and being able to have a vision.
	(4)	To learn topic relevant to modern and historical concerns that human and society face through variety of classes.	To acquire advanced knowledge of topic relevant to modern and historical concerns that human and society face through variety of classes. Also, to be able to precisely explain about the topics.	To acquire advanced knowledge of topic relevant to modern and historical concerns that human and society face through variety of classes. Also, to be able to explain about the topics.	To acquire advanced knowledge of topic relevant to modern and historical concerns that human and society face through variety of classes. Also, to be able to explain about the topics.
	(5)	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.	Being able to very fully understand, learn and explain logical framework and system of basic studying according to each subject and necessary knowledge and skills for constructing learning.	Being able to fully understand, learn and explain logical framework and system of basic studying according to each subject and necessary knowledge and skills for constructing learning.	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.
	(6)	Able to understand, learn, and explain the necessity of college education, career education, and a code of ethics.	Able to understand, learn, and explain the necessity of college education, career education, and a code of ethics especially well.	Able to sufficiently understand, learn, and explain the necessity of college education, career education, and a code of ethics.	Able to understand, learn, and explain the necessity of college education, career education, and code of ethics.

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
Abilities and Skills	(1)	To acquire basic mathematical abilities (Ability to understand concepts, calculation ability, argumentation ability).	1. Being able to understand the contents of definition of basic and mathematical concepts and to explain them giving some examples. 2. Being able to logically carry out transformation of numerical expressions and propositions. 3. Being able to understand and prove basic propositions	1. Being able to logically carry out basic calculation with formulae and transformation of propositions. 2. Being able to state basic concept definition and to give typical examples.	1. Being able to carry out basic calculation with formulae and transformation of propositions.
	(2)	To acquire skills to formulate and solve mathematical questions.	1. Being able to collect information even on issues difficult to find solutions by themselves with various ways such as literature references, discussion with friends or seniors, information equipment, questioning teachers and to make reports. 2. Being able to explain others the basic parts of the acquired results on issues or problems. 3. Being able to logically, correctly and straightforwardly explain others the basic parts of the acquired results on issues or problems.	1. Being able to collect information even on issues difficult to find solutions by themselves with various ways such as literature references, discussion with friends or seniors, information equipment, questioning teachers and to make reports. 2. Being able to explain others the basic parts of the acquired results on issues or problems.	1. Being able to collect information even on issues difficult to find solutions by themselves with various ways such as literature references, discussion with friends or seniors, information equipment, questioning teachers and to make reports.
	(3)	To learn basic knowledge, skills, and attitudes related to information. Based on them, to be able to process, output and input information, as well as to utilize information appropriately.	Being able to use various kinds of software including programming languages, analysis and graphics and to operate computers and networks.	To be able to use various software and to control computers and networks.	To be able to use software designed for document preparation or formula manipulation. Also to be able to basically operate computers and networks.
	(4)	Being able to conduct daily communication orally or in papers using foreign languages.	Being able to conduct daily communication orally or in papers using foreign languages at a very high level.	Being able to conduct daily communication orally or in papers using foreign languages at a high level.	Being able to conduct daily communication orally or in papers using foreign languages.
	(5)	Through practice of sports, being able to explain the necessity of physical strenth and health promotion.	Being able to practice sports and explain the necessity of health promotion and fitness at a very high level.	Being able to practice sports and explain the necessity of health promotion and fitness at a high level.	Being able to practice sports and explain the necessity of health promotion and fitness.
bilities	(1)	Acquiring a ability to think logically.	1. The ability to promote discussion by raising solid foundation. 2. The ability to find solutions by making logical thought from hypotheses. 3. The ability to logically find out the reason of unsuccessful trial	Having two abilities among following ones. 1. the ability of promoting discussion giving specific reasons. 2. the ability to pierce results through logical thinking from hypotheses. 3. the ability to find the logical reasons of unsuccessful trials.	Having one ability among following ones. 1. the ability of promoting discussion giving specific reasons. 2. the ability to pierce results through logical thinking from hypotheses. 3. the ability to find the logical reasons of unsuccessful trials.
	(2)	To acquire ability to utilize mathematical thinking.	1. Being able to find out the essence of difficult concepts and to understand in their own way. 2. Being able to consider various phenomena mathematically and make them into abstraction, generalization and modeling. 3. Being able to return results from those abstracted, generalized and modeled phenomena into the former issues. 4. Being able to emulate assumable possibilities and to consider the solution of each of them. 5. The ability to find out common points from various matters and to deal them with unified methods.	Having two abilities among following ones. 1. being able to select essence from difficult concepts and understand in their own way. 2. being able to consider various matters mathematically and make them abstracted, generalized and modeled. 3. being able to return abstracted, generalized and modeled matters to former issues. 4. enumerating expected possibilities and considering each solution. 5. the ability of selecting common points from different matters and generally dealing with them.	Having one ability among following ones. 1. being able to select essence from difficult concepts and understand in their own way. 2. being able to consider various matters mathematically and make them abstracted, generalized and modeled. 3. being able to return abstracted, generalized and modeled matters to former issues. 4. enumerating expected possibilities and considering each solution. 5. the ability of selecting common points from different matters and generally dealing with them.

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
Comprehensive Ab	(3)	To acquire the ability to understand sentences and communicate information.	1. The ability to listen to others opinions carefully and to make logical statements. 2. The ability to read, appropriately integrate and write down necessary documents. 3. The ability to clearly make verbal or paper announcement on intricate information. 4.The ability to send out information with information technology.	Having two abilities among following ones. 1. the ability of listening carefully and making logical statement. 2. the ability of reading necessary papers and appropriately summing up. 3. the ability of clearly presenting intricate information verbally and in writing. 4. the ability of delivering information using information instruments	Having one ability among following ones. 1. the ability of listening carefully and making logical statement. 2. the ability of reading necessary papers and appropriately summing up. 3. the ability of clearly presenting intricate information verbally and in writing. 4. the ability of delivering information using information instruments
	(4)	To improve one's ability to learn independently.	1. Being able to study voluntarily. 2. Being able to make trial and errors in one's own way and find tips of the solution. 3. Voluntarily collecting information from limited resources. 4. Being able to make their own decision based on solid facts	Having two abilities among following ones. 1. studying voluntarily. 2. finding tips of solution through trials and errors of their own. 3. collecting information voluntarily based on limited information. 4. being able to make own decision based on specific reasons.	Having one ability among following ones. 1. studying voluntarily. 2. finding tips of solution through trials and errors of their own. 3. collecting information voluntarily based on limited information. 4. being able to make own decision based on specific reasons.
	(5)	Acquiring a mannar of tackling problems.	1. Being able to tackle difficult issues or calculations for a long time. 2. Trying to find out the essence not being misled by preconceptions. 3. Not jumping to conclusion easily toward unproved matters. 4. Trying to find out the best understanding on issues which are too difficult to find the results soon.	Having two abilities among following ones. 1. being able to tackle with difficult issues or calculations for a long time. 2. trying to find out essence without preconceptions. 3. not jumping to results easily on unproven matters. 4. trying to get the best solution at present on issues difficult to get results soon.	Having one ability among following ones. 1. being able to tackle with difficult issues or calculations for a long time. 2. trying to find out essence without preconceptions. 3. not jumping to results easily on unproven matters. 4. trying to get the best solution at present on issues difficult to get results soon.

Placement of Liberal Arts Education in the Major Program

The liberal arts education in this program aims to build the academic foundation required for the specialized education, and develops the capability for autonomous study, as well as scientific and mathematical intelligence based on the ability to collect, analyze, and critically evaluate data. It also enables students to establish the perspective necessary to insight into the essentials and background of phenomena, to develop the broad range of knowledge required for living in a modern society, and to integrate such knowledge

Relationships between the evaluation items and class subjects

Subject Classification	Subject Name	Credits	Type of course registration	Grade	Evaluation items																												Total weighted values of evaluation items in the
					Knowledge and Understanding												Abilities and Skills										Comprehensive Abilities									
					(1)		(2)		(3)		(4)		(5)		(6)		(1)		(2)		(3)		(4)		(5)		(1)		(2)		(3)		(4)		(5)	
					Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	
Liberal Arts Education	Peace Science Courses	2	Elective/required	1							100	1																							100
Liberal Arts Education	Introduction to University Education	2	Required	1											100	1																			100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	Required	1	25	1																					25	1	25	1	25	1			100
Liberal Arts Education	Advanced seminar	1	Free elective	1～2	25	1																					25	1	25	1	25	1			100
Liberal Arts Education	Area Courses	8	Elective/required	1～4							100	1																							100
Liberal Arts Education	Basic English Usage I	1	Free elective	1																			100	1											100
Liberal Arts Education	Basic English Usage II	1	Free elective	2																			100	1											100
Liberal Arts Education	Communication Ⅰ	2	Required	1																			100	1											100
Liberal Arts Education	Communication Ⅱ	2	Required	2																			100	1											100
Liberal Arts Education	Foreign Languages: Basic Studies Ⅰ	1	Elective/required	1																			100	1											100
Liberal Arts Education	Foreign Languages: Basic Studies Ⅱ	1	Elective/required	1																			100	1											100
Liberal Arts Education	Foreign Languages: Basic Studies Ⅲ	1	Elective/required	2																			100	1											100
Liberal Arts Education	Foreign Languages: Basic Studies Ⅳ	1	Elective/required	2																			100	1											100
Liberal Arts Education	Introduction to Information and Data Sciences	2	Required	1																	100	1													100
Liberal Arts Education	Computer Programming	2	Elective/required	1																	100	1													100
Liberal Arts Education	Intelligence and Computer	2	Elective/required	2																	100	1													100
Liberal Arts Education	Starting Programming from Scratch	2	Elective/required	2																	100	1													100
Liberal Arts Education	Fundamental Date Science	2	Elective/required	2																	100	1													100
Liberal Arts Education	Health and Sports Courses	2	Elective/required	1～2																					100	1									100
Liberal Arts Education	Social Cooperation Courses	0	Free elective	1～2											100	1																			100
Liberal Arts Education	Linear Algebra I	2	Required	1	100	1																													100
Liberal Arts Education	Seminar in Linear Algebra I	1	Required	1	100	1																													100
Liberal Arts Education	Linear Algebra Ⅱ	2	Required	2	100	1																													100
Liberal Arts Education	Seminar in Linear Algebra Ⅱ	1	Required	2	100	1																													100
Specialized Education	Introduction to Mathematics	2	Required	1	100	1																													100
Specialized Education	Introduction to Information Mathematics	2	Elective/required	2									100	1																					100
Specialized Education	Introduction to Physics A	2	Elective/required	1									100	1																					100
Specialized Education	Introduction to Physics B	2	Elective/required	2									100	1																					100
Specialized Education	Introduction to Chemistry A	2	Elective/required	1									100	1																					100
Specialized Education	Introduction to Chemistry B	2	Elective/required	2									100	1																					100
Specialized Education	Introduction to Biological Sciences A	2	Elective/required	1									100	1																					100
Specialized Education	Introduction to Biological Sciences B	2	Elective/required	2									100	1																					100
Specialized Education	Introduction to Earth and Planetary Sciences	2	Elective/required	1									100	1																					100
Specialized Education	Introduction to Earth and Planetary Sciences	2	Elective/required	2									100	1																					100
Specialized Education	English Seminar on Mathematics	1	Elective/required	4																			100	1											100
Specialized Education	Analysis I	2	Required	1	50	1											50	1																	100
Specialized Education	Exercises in Algebra I	1	Required	1	50	1											50	1																	100
Specialized Education	Analysis II	2	Required	2	50	1											50	1																	100

Subject Classification	Subject Name	Credits	Type of course registration	Grade	Evaluation items																												Total weighted values of evaluation items in the
					Knowledge and Understanding												Abilities and Skills										Comprehensive Abilities									
					(1)		(2)		(3)		(4)		(5)		(6)		(1)		(2)		(3)		(4)		(5)		(1)		(2)		(3)		(4)		(5)		
					Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	
Specialized Education	Exercises in Algebra II	1	Required	2	50	1											50	1																	100
Specialized Education	Analysis III	2	Required	3	50	1											50	1																	100
Specialized Education	Exercises in Algebra III	1	Required	3	50	1											50	1																	100
Specialized Education	Analysis IV	2	Required	4	50	1											50	1																	100
Specialized Education	Exercises in Algebra IV	1	Required	4	50	1											50	1																	100
Specialized Education	Algebra I	2	Required	3	50	1											50	1																	100
Specialized Education	Exercises in Algebra I	1	Required	3	50	1											50	1																	100
Specialized Education	Algebra II	2	Required	4	50	1											50	1																	100
Specialized Education	Exercises in Algebra II	1	Required	4	50	1											50	1																	100
Specialized Education	Fundamental Concepts of Mathematics I	2	Required	3	50	1											50	1																	100
Specialized Education	Exercises in Fundamental Concepts	1	Required	3	50	1											50	1																	100
Specialized Education	Fundamental Concepts of Mathematics II	2	Required	4	50	1											50	1																	100
Specialized Education	Exercises in Fundamental Concepts	1	Required	4	50	1											50	1																	100
Specialized Education	Exercises in Mathematical Software	2	Required	3	50	1															50	1													100
Specialized Education	Special Study of Mathematics and Informatics for Graduation	各5	Required	7～8													10	1	10	1	10	1					14	1	14	1	14	1	14	1	14	1	100
Specialized Education	Algebra A	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Algebra A	2	Elective/required	5													50	1	50	1															100
Specialized Education	Algebra B	2	Elective/required	6			50	1									50	1																	100
Specialized Education	Exercises in Algebra B	2	Elective/required	6													50	1	50	1															100
Specialized Education	Geometry A	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Geometry A	2	Elective/required	5													50	1	50	1															100
Specialized Education	Geometry B	2	Elective/required	6			50	1									50	1																	100
Specialized Education	Exercises in Geometry B	2	Elective/required	6													50	1	50	1															100
Specialized Education	Analysis A	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Algebra A	2	Elective/required	5													50	1	50	1															100
Specialized Education	Analysis B	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Algebra B	2	Elective/required	5													50	1	50	1															100
Specialized Education	Analysis C	2	Elective/required	6			50	1									50	1																	100
Specialized Education	Exercises in Algebra C	2	Elective/required	6													50	1	50	1															100
Specialized Education	Analysis D	2	Elective/required	6			50	1									50	1																	100
Specialized Education	Exercises in Algebra D	2	Elective/required	6													50	1	50	1															100
Specialized Education	Mathematics for Computation	2	Elective/required	4			50	1									50	1																	100
Specialized Education	Exercises in Mathematics for	2	Elective/required	4															50	1	50	1													100
Specialized Education	Mathematics for Computation A	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Mathematics for	2	Elective/required	5															50	1	50	1													100
Specialized Education	Probability and Mathematical Statistics	2	Elective/required	5			50	1									50	1																	100
Specialized Education	Exercises in Probability and Mathematical	2	Elective/required	5													50	1	50	1															100
Specialized Education	Algebra C	2	Free elective	7					100	1																									100
Specialized Education	Algebra D	2	Free elective	8					100	1																									100
Specialized Education	Geometry C	2	Free elective	7					100	1																									100
Specialized Education	Geometry D	2	Free elective	8					100	1																									100

Subject Classification	Subject Name	Credits	Type of course registration	Grade	Evaluation items																														Total weighted values of evaluation items in the
					Knowledge and Understanding												Abilities and Skills										Comprehensive Abilities										
					(1)		(2)		(3)		(4)		(5)		(6)		(1)		(2)		(3)		(4)		(5)		(1)		(2)		(3)		(4)		(5)		
					Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	
Specialized Education	Elementary nonlinear studies	2	Free elective	6					100	1																										100
Specialized Education	Mathematical Analysis A	2	Free elective	7					100	1																										100
Specialized Education	Mathematical Analysis B	2	Free elective	8					100	1																										100
Specialized Education	Probability and Mathematical Statistics	2	Free elective	6					100	1																										100
Specialized Education	Probability and Mathematical Statistics	2	Free elective	8					100	1																										100
Specialized Education	Data Science	2	Free elective	4					50	1											50	1														100
Specialized Education	Algebra E	2	Free elective	7〜8					50	1											50	1														100
Specialized Education	Mathematics for Modeling and Simulation	2	Free elective	6					50	1											50	1														100
Specialized Education	Theory of Complex Systems	2	Free elective	7					50	1											50	1														100
Specialized Education	Mathematics for Computation B	2	Free elective	8					50	1											50	1														100
Specialized Education	Mathematics Internship	1	Free elective	5																	100	1														100
Specialized Education	Topics in Mathematics	2	Free elective	7〜8					100	1																										100

Curriculum Map of Mathematics

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
Knowledge and Understanding	Understanding classical basic theory which is a base of modern mathematics. Being able to find and explain issues from specific events.	Introductory Seminar for First-Year Students(◎)	Analysis II(◎)	Analysis III(◎)	Analysis IV(◎)				
		Linear Algebra I(◎)	Exercises in Analysis II(◎)	Exercises in Analysis III(◎)	Exercises in Analysis IV(◎)				
		Seminar in Linear Algebra I (◎)	Seminar in Linear Algebra II (◎)	Algebra I(◎)	Algebra II(◎)				
		Advanced seminar (△)	Advanced seminar (△)	Exercises in Algebra I(◎)	Exercises in Algebra II(◎)				
		Introduction to Mathematics (◎)	Linear Algebra II(◎)	Fundamental Concepts of Mathematics I(◎)	Fundamental Concepts of Mathematics II(◎)				
		Analysis I(◎)		Exercises in Fundamental Concepts Mathematics I(◎)	Exercises in Fundamental Concepts Mathematics II(◎)				
		Exercises in Analysis I(◎)		Exercises in Mathematical Software(◎)					
	Understanding on primary theory of modern mathematics established on classical theory.				Mathematics for Computation (○)	Algebra A(○)	Algebra B(○)		
						Geometry A(○)	Geometry B(○)		
						Analysis A(○)	Analysis C(○)		
						Analysis B(○)	Analysis D(○)		
						Mathematics for Computation A(○)			
						Probability and Mathematical Statistics A(○)			
	Acquiring knowledge and vision on advanced theories as an extension of core theory of modern mathematics.				Data Science(△)		elementary nonlinear studies (△)	Algebra C(△)	Algebra D(△)
							Probability and Mathematical Statistics B(△)	Geometry C(△)	Geometry D(△)
							Mathematics for Modeling and Simulation(△)	Mathematical Analysis A(△)	Mathematical Analysis B(△)
								Theory of Complex Systems (△)	Mathematics for Computation B (△)
								Topics in Geometry(△)	Probability and Mathematical Statistics C(△)
								Topics in Analysis(△)	Topics in Algebra(△)
								Topics in Probability and Mathematical Statistics(△)	AlgebraE
								AlgebraE	
	To learn topic relevant to modern and historical concerns that human and society face through variety of classes.	Peace Science Courses(○)	Area Courses(○)	Area Courses(○)	Area Courses(○)				
		Area Courses(○)							
	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 Information Mathematics(○)						
		Introduction to Chemistry A (○)	Introduction to Physics B (○)						
		Introduction to Biological SciencesA(○)	Introduction to Chemistry B (○)						
		Introduction to Earth and Planetary Sciences A(○)	Introduction to Biological SciencesB(○)						
			Introduction to Earth and Planetary Sciences B(○)						
	Able to understand, learn, and explain the necessity of college education, career education, and a code of ethics.	Introduction to University Education(◎)	Social Cooperation Courses (△)						
		Social Cooperation Courses (△)							

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 basic mathematical abilities (Ability to understand concepts, calculation ability, argumentation ability).	Analysis I(◎)	Analysis II(◎)	Analysis III(◎)	Analysis IV(◎)	Algebra A(○)	Algebra B(○)	Special Study of Mathematics and Informatics for Graduation (◎)	Special Study of Mathematics and Informatics for Graduation (◎)
		Exercises in Analysis I(◎)	Exercises in Analysis II(◎)	Exercises in Analysis III(◎)	Exercises in Analysis IV(◎)	Exercises in Algebra A(○)	Exercises in Algebra B(○)		
				Algebra I(◎)	Algebra II(◎)	Geometry A(○)	Geometry B(○)		
				Exercises in Algebra I(◎)	Exercises in Algebra II(◎)	Exercises in Geometry A (○)	Exercises in Geometry B (○)		
				Fundamental Concepts of Mathematics I(◎)	Fundamental Concepts of Mathematics II(◎)	Analysis A(○)	Analysis C(○)		
				Exercises in Fundamental Concepts Mathematics I(◎)	Exercises in Fundamental Concepts Mathematics II(◎)	Exercises in Analysis A(○)	Exercises in Analysis C(○)		
					Mathematics for Computation (○)	Analysis B(○)	Analysis D(○)		
						Exercises in Analysis B(○)	Exercises in Analysis D(○)		
						Mathematics for Computation A(○)			
						Probability and Mathematical Statistics A(○)			
						Exercises in Probability and Mathematical Statistics A (○)			
	To acquire skills to formulate and solve mathematical questions.				Exercises in Mathematics for Computation(○)	Exercises in Algebra A(○)	Exercises in Algebra B(○)	Special Study of Mathematics and Informatics for Graduation (◎)	Special Study of Mathematics and Informatics for Graduation (◎)
						Exercises in Geometry A (○)	Exercises in Geometry B (○)		
						Exercises in Analysis A(○)	Exercises in Analysis C(○)		
						Exercises in Analysis B(○)	Exercises in Analysis D(○)		
						Exercises in Mathematics for Computation A(○)			
						Exercises in Probability and Mathematical Statistics A (○)			
	To learn basic knowledge, skills, and attitudes related to information. Based on them, to be able to process, output and input information, as well as to utilize information appropriately.	Introduction to Information and Data Sciences(◎)	Intelligence and Computer (○)	Exercises in Mathematical Software(◎)	Exercises in Mathematics for Computation(○)	Exercises in Mathematics for Computation A(○)	Mathematics for Modeling and Simulation(△)	Special Study of Mathematics and Informatics for Graduation (◎)	Special Study of Mathematics and Informatics for Graduation (◎)
		Computer Programming(○)	Starting Programming from Scratch(○)		Data Science(△)			Theory of Complex Systems (△)	Mathematics for Computation B (△)
			Fundamental Date Science (○)					AlgebraE	AlgebraE
	Being able to conduct daily communication orally or in papers using foreign languages.	Communication IA(◎)	Communication IIA(◎)						
		Communication IB(◎)	Communication IIB(◎)						
		Foreign Languages: Basic Studies I(○)	Foreign Languages: Basic Studies Ⅲ(○)						
		Foreign Languages: Basic Studies II(○)	Foreign Languages: Basic Studies Ⅳ(○)						
		Basic English Usage I(△)	Basic English Usage II(△)		English Seminar on Mathematics(○)				
	Through practice of sports, being able to explain the necessity of physical strenth and health promotion.	Health and Sports Courses (○)	Health and Sports Courses (○)						

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
Comprehensive Abilities	(1) Acquiring a ability to think logically. (2) To acquire ability to utilize mathematical thinking. (3) To acquire the ability to understand sentences and communicate information.	Introductory Seminar for First-Year Students(◎)						Special Study of Mathematics and Informatics for Graduation (◎)	Special Study of Mathematics and Informatics for Graduation (◎)
		Advanced seminar (△)	Advanced seminar (△)						
	(4) To improve one's ability to learn independently. (5) Acquiring a mannar of tackling problems.							Special Study of Mathematics and Informatics for Graduation (◎)	Special Study of Mathematics and Informatics for Graduation (◎)

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