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

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

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 month5.9(r(e c)il)5.245.9arnsegt -2.4(a)4.3(3(k)-6e6(e)-7(arch sever

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.

Liberal Arts Education Subjects

(Note 1)　The i[...]
　　　year, h[...]

(Note 2)　It is re[...]
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　　　　Credit[...]
　　　Spanish,[...]

(Note 3)　Achiev[...]
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(Note 4)　The cre[...]

(Note 5)　The cre[...]

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(Note 7)　For the 1[...]
　　　subjects.

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(Note 9)　The subje[...]
　　　and Statisti[...]

(Note 10)　The classe[...]

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		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
		1	2	3	4	5	6	7	8
Introduction to Information Mathematics	2		○						
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				○				
Introduction to Mathematics	2	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					
Special Study of Mathematics and Informatics for Graduation	Each 5	Required						⑤	⑤
Advanced Mathematics	2					○			
Advanced Physics	2				○				
Advanced Chemistry	2						○		
Advanced Biology	2					○			
Advanced Earth and Planetary Science	2						○		
Algebra A	2					○			
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 D	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							○	
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					○			
Network and Algebra(Note 8)	2							○	○

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

1. The ability to listen to others opinions carefully

(3) To acquire the ability to understand sentences and communicate information.

Curriculum Map of Mathematics

Academic achievements / Evaluation items	1st grade Spring semester	1st grade Fall semester	2nd grade Spring semester	2nd grade Fall semester	3rd grade Spring semester	3rd grade Fall semester	4th grade Spring semester	4th grade 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; Linear Algebra I; Seminar in Linear Algebra I; Introduction to Mathematics; Analysis I; Exercises in Analysis I	Analysis II; Exercises in Analysis II; Seminar in Linear Algebra II; Linear Algebra II	Analysis III; Exercises in Analysis III; Algebra I; Exercises in Algebra I; Fundamental Concepts of Mathematics I; Exercises in Fundamental Concepts Mathematics I; Exercises in Mathematical Software	Analysis IV; Exercises in Analysis IV; Algebra II; Exercises in Algebra II; Fundamental Concepts of Mathematics II; Exercises in Fundamental Concepts Mathematics II				
Understanding on primary theory of modern mathematics established on classical theory.				Mathematics for Computation	Algebra A; Geometry A; Analysis A; Analysis B; Mathematics for Computation A; Probability and Mathematical Statistics A	Algebra B; Geometry B; Analysis C; Analysis D		
Acquiring knowledge and vision on advanced theories as an extension of core theory of modern mathematics.				Data Science		elementary nonlinear studies; Probability and Mathematical Statistics B; Mathematics for Modeling and Simulation	Algebra C; Geometry C; Mathematical Analysis A; Theory of Complex Systems; Topics in Geometry; Topics in Analysis; Topics in Probability and Mathematical Statistics; Network and Algebra	Algebra D; Geometry D; Mathematical Analysis B; Mathematics for Computation; Probability and Mathematical Statistics C; Topics in Algebra; Network and Algebra
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; Introduction to Chemistry; Introduction to Biological SciencesA; Introduction to Earth and Planetary Sciences	Introduction to Information Mathematics; Introduction to Physics B; Introduction to Chemistry B; Introduction to Biological SciencesB; Introduction to Earth and Planetary Sciences B						
Able e Tn q education, and a code of ethics.	Introduction to University Education; Social Cooperation Courses	Social Cooperation Courses of college education, career						

Academic achievements / Evaluation items	1st grade Spring semester	1st grade Fall semester	2nd grade Spring semester	2nd grade Fall semester	3rd grade Spring semester	3rd grade Fall semester	4th grade Spring semester	4th grade Fall semester
Abilities and Skills — To acquire basic mathematical abilities (Ability to understand concepts, calculation ability, argumentation ability).	Analysis I; Exercises in Analysis I	Analysis II; Exercises in Analysis II	Analysis III; Exercises in Analysis III; Algebra I; Exercises in Algebra I; Fundamental Concepts of Mathematics I; Exercises in Fundamental Concepts Mathematics I	Analysis IV; Exercises in Analysis IV; Algebra II; Exercises in Algebra II; Fundamental Concepts of Mathematics II; Exercises in Fundamental Concepts Mathematics II; Mathematics for Computation	Algebra A; Exercises in Algebra A; Geometry A; Exercises in Geometry A; Analysis A; Exercises in Analysis A; Analysis B; Exercises in Analysis B; Mathematics for Computation A; Probability and Mathematical Statistics A; Exercises in Probability and Mathematical Statistics A	Algebra B; Exercises in Algebra B; Geometry B; Exercises in Geometry B; Analysis C; Exercises in Analysis C; Analysis D; Exercises in Analysis D	Special Study of Mathematics and Informatics for Graduation	Special Study of Mathematics and Informatics for Graduation
To acquire skills to formulate and solve mathematical questions.				Exercises in Mathematics for Computation	Exercises in Algebra A; Exercises in Geometry A; Exercises in Analysis A; Exercises in Analysis B; Exercises in Mathematics for Computation A; Exercises in Probability and Mathematical Statistics A	Exercises in Algebra B; Exercises in Geometry B; Exercises in Analysis C; Exercises in Analysis D	Special Study of Mathematics and Informatics for Graduation	Special Study of Mathematics and Informatics for Graduation
Abilities and Skill — 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; Computer Programming	Intelligence and Computer; Ground zero programming; Fundamental Date Science	Exercises in Mathematical Software	Exercises in Mathematics for Computation; Data Science	Exercises in Mathematics for Computation A	Mathematics for Modeling and Simulation	Special Study of Mathematics and Informatics for Graduation; Theory of Complex Systems; Network and Algebra	Special Study of Mathematics and Informatics for Graduation; Mathematics for Computation B; Network and Algebra
Being able to conduct daily communication orally or in papers using foreign languages.	Communication IA; Communication IB; Foreign Languages: Basic Studies I; Foreign Languages: Basic Studies II; Basic English Usage I	Communication IIA; Communication IIB; Foreign Languages: Basic Studies; Foreign Languages: Basic Studies; 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
(4) To improve one's ability to learn independently.							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