For entrants in AY 2022

Appended Form 1

Specifications for Major Program

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

Program name (Japanese)	物理学プログラム
(English)	Physics

1. Degree to be obtained: Bachelor of Science

2. Overview

In the educational program provided by the Department of Physics, students study the specialized basic subjects and specialized subjects related to physics in the specialized education course of the major program. They are able to select specialized subjects in which they can study state of the art knowledge in areas such as space, elementary particles, materials science, and optics.

The study of physics is a bottom-up process. In the Physics Program, subjects are arranged as a hierarchy as liberal arts education subjects, specialized basic subjects, and specialized subjects, in order to enable students to acquire knowledge, abilities, and skills related to physics. In the courses before students take specialized subjects, they are educated to acquire the basic academic skills required for science studies in general, not limited to fields of physics. In particular, for the fundamental subjects and specialized fundamental subjects, lectures are provided based on a model syllabus in which important items students are required to learn in this program are systematically organized into a step-by-step process. In the specialized courses, students are permitted to observe the research activities of faculty members, in order to gain an understanding of the details of state-of-the-art research in the area they have chosen, and to acquire knowledge, abilities, and skills related to physics. The study in specialized courses is designed to have a certain continuity with courses in the graduate school. The liberal arts subjects which are not directly related to the basics for physics are intended to achieve the aim of liberal arts education in Hiroshima University, namely to allow students to broaden their personality and vision, and to develop the ability to take various situations into consideration from broad perspective. As such, the time at which students have to take these subjects is not precisely stipulated.

This program also provides sufficient education to meet the requirements for students who want to obtain the certification for science teacher at junior and senior high school.

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

This program aims to educate students to acquire the basic and specialized knowledge, abilities, and skills related to physics listed below, and then obtain the capabilities required for specialized education and research in the graduate school, so that they can become researchers at universities or public research institutes or engineers and experts working in companies. Based on the aim above, this program will award the degree of bachelor of science to the students who will have earned the required credits defined for the education course, in addition to the following:

・ Basic knowledge, abilities, and skills related to physics;

- The ability to think logically while fully applying knowledge, abilities, and skills related to physics to objective facts derived from experiments, observations, and the results of model calculations;
- The qualities necessary for working in various areas such as scientific research, education, and business, with a broad perspective that is not limited to the fields of physics and ethics; and
- An international consciousness, and the ability to report, discuss, and present scientific contents in English.

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

To allow students to obtain the knowledge, abilities, and skills related to physics that represent the culmination of the learning process, this program is composed of subject groups that are organized hierarchically into those of liberal arts subjects, specialized basic subjects, and specialized subjects. Courses taken before students take specialized subjects are designed to educate students to acquire the basic academic skills required for scientific studies in general, not limited to the fields of physics. For specialized basic subjects, practical lessons are provided, corresponding to each lecture, to educate students to develop their understanding and ability in the application of physics. Their academic achievement is evaluated based on their grade scores for the subjects and their achievement level against the target set for this program. The educational courses are organized and implemented according to the following policies:

- Students are able to acquire the basics of physics through the study of subjects such as mathematics in physics, mechanics, electromagnetism, quantum mechanics, and thermodynamics and statistical mechanics. Furthermore, students enhance their knowledge and understanding in their specialized area through specialized subjects provided for advanced expertise. In addition to this, students learn experiment techniques in the subject "experiments in general physics";
- Students receive education in the subject "experiments in general physics" and their graduation research to obtain the ability to think logically while fully applying their knowledge, abilities, and skills related to physics to objective facts derived from experiments, observations, and the results of model calculations;
- Students are able, through liberal arts subjects, seminars, and graduation research to acquire the necessary qualities for working in various areas such as scientific research, education, and business, with a broad perspective that is not limited to the fields of physics and ethics; and
- Students are able, through the study of foreign languages, seminars, and graduation research to acquire an international consciousness and the ability to report, discuss, and present scientific contents in English.

5. Start time and acceptance conditions

The School of Science holds entrance examinations for each department and stipulates detailed requirements for admission to the departments in its application guidelines. This program is organized primarily for students of the Department of Physics. Students choose this program when they enter the university. Students who enter the Department of Physics are expected to have mastered the following subjects in high school:

Subject name: Mathematics, Physics

This program also accepts other students of the university. Requirements for when a student not from the Department of Physics chooses this program are stipulated separately, based on the provisions regarding transfer between schools or departments.

6. Obtainable qualifications

○ Educational personnel certification

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

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

○ Curator license

○ 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 these 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 current 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. Purpose

Students are able to observe the research activities of faculty members in order to broaden their understanding of state-of-the-art research in their area of choice. In addition to organizing the knowledge of physics that they have acquired up to the third year, they are able to acquire further specialized understanding that can be used in graduate school courses, as well as the abilities and skills required by independent researchers.

2. Overview

The contents of the graduation research vary widely depending on the laboratory to which the student is allocated. Students are able to get to know the specialty of each mentor while taking the subject "advanced

physics." The topic for graduation research in the laboratory made known during a focused guidance session.

3. Student allocation timing and method

1 Students are allocated to a laboratory at the beginning of the fourth academic year. To be allocated to a laboratory, students must satisfy the "Conditions for Starting Graduation Research."

2 For the "Conditions for Starting Graduation Research," refer to "Criteria for Attendance 2" in “Study Guidance for the Physics Program” in the "Students Handbook" (received when the student enters the university).

10. Responsibility

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

The faculty committee of the Physics Program (chief: chair of the Department of Physics) is engaged in the “plan” and “do” processes.

For the processes "check" and "act", the chair of the Department of Physics consults with the committee responsible (the education affairs committee) 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

1 Perspectives for evaluation of the program

The program is reviewed and evaluated in general for its contents and composition, based on the level of understanding and achievement of students, taking into account the standard levels of knowledge in physics.

2 Evaluation method (also describing the relationship to class evaluation)

The program is reviewed and evaluated by the faculty committee based on evaluation from the perspective both of the students and of the faculty members.

From the perspective of the students, the program is reviewed based on the results of the analysis of the "class questionnaire", as well as on the opinions and requests expressed during the "roundtable meeting with students”. From the perspective of members of faculty, the program is reviewed based on the analysis of the "faculty members' evaluation of achievement in the subject" using such measures as score distribution and results of follow-up checks. The education affairs committee prepares a draft of the report on the review and evaluation, and the faculty committee discusses it.

3 Policy and method for feedback to students

Based on the evaluation of the level of understanding and achievement of students, feedback is provided regarding the methodology and contents of classes, the teachers in charge of the classes, and the composition of the program.

(1) Methodology and contents of class

Based on the results of the analysis of the "class questionnaire" and the analysis of the "faculty members' evaluation of achievement in the subject", advice is provided to the faculty members who are in charge of the classes for the purpose of reviewing or improving of the methodology and contents of the classes.

(2) Teachers in charge of the classes

Although an appropriate faculty member is assigned to each subject, consideration may be given to possibly changing the faculty member based on evaluation of the analysis of the "class questionnaire".

(3) Review of the composition of the program

Revision of the program that requires revision of the curriculum is conducted from both mid- and long-term perspectives. Even in the case of minor revisions, while taking into account the current stage that has been reached in the academic year, these revisions are made in order to help students improve their understanding and achievement.

Table of Registration Standards for Physics Program (Entrants of 2022)

Refer to Study Guidance for the Physics 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 Physics Program certifies is accepted as the required credit for graduation.

＊Students who have earned the required number of credits (refer to the Student Handbook for the details) can acquire the type 1 license for junior high school teachers (science), the type 1 license for senior high school teachers (science), the 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	○							
	Common Subjects	Basic Courses in University	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			8		From "Area Courses" (Note 2)	1 or 2	Elective/required	○	○	○	○				
		Foreign Languages	English (Note 3)	Basic English Usage	6	2	Basic English Usage I	1	Required	①							
							Basic English Usage II	1			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 (German, French, Spanish, Russian, Chinese, Korean and Arabic) (Note 4)			(0)	Foreign Languages: Basic Studies Ⅰ	1	Free elective	○							
							Foreign Languages: Basic Studies Ⅱ	1		○							
							Foreign Languages: Basic Studies Ⅲ	1			○						
							Foreign Languages: Basic Studies Ⅳ	1			○						
		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			○						
							Ground zero programming	2			○						
							Fundamental Date Science	2			○						
		Health and Sports Courses (Note 5)			(0)		From "Health and Sports Courses"	1 or 2	Free elective	○	○						
		Social Cooperation Courses (Note 6)			(0)		From "Social Cooperation Courses"	1 or 2	Free elective	○	○						
		Foundation Courses			10	10	Calculus I	2	Required	②							
							Calculus II	2			②						
							Linear Algebra I	2		②							
							Linear Algebra II	2			②						
							Experimental Methods and Laboratory Work in Physics Ⅰ	1				①					
							Experimental Methods and Laboratory Work in Physics Ⅱ	1				①					
						(0)	From "Foundation Courses"	1 or 2	Free elective	○	○	○	○	○	○		
	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) 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 3) The credit for "Field Research in the English-speaking World" that is earned through such activities as a short-term study abroad, and that for "Online English Seminar A" and "Online English Seminar B", that is earned through self-study, are accepted as the credit for the subject "Communication I and II".
Achievement in a foreign language skill test might also be accepted as credit. For the details, refer to the description of English subjects in Liberal Arts Education and the item "Credit based on Achievement in Foreign Language Skill Tests" in the Student Handbook.

(Note 4) ・The credit for "Foreign Languages: Basic Studies Ⅰ, Ⅱ, Ⅲ and Ⅳ" is accepted as credits for the category of "Any subject".
・Arabic course is limited to Ⅰ and Ⅱ.

(Note 5) Take the subject as a requested subject "Health and Sports Courses".The credit of the subject "Health and Sports Courses" is accepted as credit for the category of "Any

(Note 6) The credit of the subject "Social Cooperation Courses" is accepted as credit for the category of "Any subject".

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

(Note 7) To achieve the 82 credits required for the "Specialized Education Subjects", it is required to earn 12 or more credits for elective required subjects(except the elective required subjects in the "Specialized Basic Subjects") and free elective subjects, as well as 54 credits for required subjects and 16 credits for elective required subjects.

(Note 8) Any credit earned that exceeds 4 credits is accepted as credit for the category of "Any subject".

(Note 9) It is strongly recommended to take the subject as a requested subject for Physics Program.

(Note 10) For taking the subject "Special Lectures in Physics", refer to the Study Guidance for the Physics Program. Check the semester and term in which the subject is provided, because some subjects might be provided in an intensive course.

(Note 11) Because 128 credits are required for graduation, it is required to earn 12 or more credits, regardless of the categorization, in Liberal Arts Education Subjects and Specialized Education Subjects in addition to the required credits for each subject category (116 credits in total, that consist of 34 credits for Liberal Arts Education Subjects and 82 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 2 credits for the subject "Basic Foreign Language Ⅰ, Ⅱ, Ⅲ and Ⅳ" for "second foreign languages"
・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 other programs in other schools (except those admitted by the faculty committee of Physics 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	82 (Note 7)	4 (Note 8)	Introduction to Mathematics	2	Elective/required	○							
				Introduction to Information Mathematics	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			○						
				2 subjects (4 credits) from the eight subjects above										
			35	Mechanics A	2	Required	②							
				Mechanics B	2			②						
				Exercises in Mechanics	2			②						
				Mathematics for Physics B	2			②						
				Analytical Mechanics	2				②					
				Thermodynamics Mechanics	2				②					
				Electromagnetism Ⅰ	2				②					
				Exercises in Electromagnetism	2				②					
				Mathematics for Physics C	2				②					
				Electromagnetism Ⅱ	2					②				
				Quantum Mechanics Ⅰ	3					③				
				Mathematics for Physics D	2					②				
				Quantum Mechanics Ⅱ	2						②			
				Exercises in Quantum Mechanics	2						②			
				Statistical Mechanics Ⅰ	2						②			
				Statistical Mechanics Ⅱ	2							②		
				Exercises in Statistical Mechanics	2							②		
				Exercises of Physics (Note 9)	2	Free elective	○							
				Mathematics for Physics A (Note 9)	2		○							
				Introduction of Physics (Note 9)	2			○						
				Exercise in Electromagnetism and Quantum Mechanics (Note 9)	2					○				
				Computational Physics (Note 9)	2					○				
				English for Physics	2				○					
				Physics Internship	1				○					
	Specialized Subjects		19	Experimental Methods in Physics	2	Required				②				
				Laboratory in Physics Ⅰ	3						③			
				Laboratory in Physics Ⅱ	3							③		
				Physics Seminar	3								③	
				Special Study for Graduation A	4								④	
				Special Study for Graduation B	4									④
			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										
			10以上	Structural and Physical Properties of Solid	2	Elective/required					○			
				Theory of Relativity (Note 9)	2						○			
				Applied Electromagnetic Mechanics	2						○			
				Nuclear and Particle Physics	2						○			
				Molecular Physics	2							○		
				Quantum Mechanics Ⅲ (Note 9)	2							○		
				Solid State Physics Ⅰ	2							○		
				Astrophysics	2							○		
				Mechanics of Continuous Media (Note 9)	2							○		
				Relativistic Quantum Mechanics	2								○	
				Solid State Physics Ⅱ	2								○	
				"Special Lectures in Physics" (Note 10)			○	○	○	○	○	○	○	○
				At least 5 subjects (10credits) from the twelve subjects above										
				"Basic Specialized Subjects" and "Specialized Subjects" offered by other programs of School of Science		Free elective	○	○	○	○	○	○	○	○
Any subject		12		(Note 11)			○	○	○	○	○	○	○	○
Total		128												

Academic achievements of Physics Program

Relationships between the evaluation items and evaluation criteria

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	Knowledge and understanding of physical mathematics, mechanics, electromagnetism, thermodynamics, statistical mechanics and quantum mechanics.	To be able to sufficiently understand and consider physical mathematics, mechanics, electromagnetism, thermodynamics, statistical mechanics and quantum mechanics. Also, to be able to further consider.	To be able to sufficiently understand and consider physical mathematics, mechanics, electromagnetism, thermodynamics, statistical mechanics and quantum mechanics.	To be able to understand the basics of physical mathematics, mechanics, electromagnetism, thermodynamics, statistical mechanics and quantum mechanics.
	(2)	Knowledge and understanding of specialized field of elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics.	To be able to precisely understand technical knowledge of elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics. Also, to be able to evolve opinions logically.	To be able to precisely understand and examine basic technical knowledge about elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics.	To be able to understand and examine basic technical knowledge about elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics.
	(3)	Acquiring science english・foreign language that you can practice reading comprehension, journal publication, conference presentation.	1. Being able to correctly understand the contents of papers written in English or other languages. 2. Being able to appropriately write scientific contents in English or other languages. 3. Being able to make well -grounded discussion and effective presentations in English or other languages.	1. Being able to understand the contents of papers written in English or other languages. 2. Being able to write scientific contents in English or other languages. 3. Being able to make discussion and presentations in English or other languages.	1. Being able to understand the contents of papers written in English or other languages. 2. Being able to write scientific contents in English or other languages.
	(4)	The knowledge and understanding on construction and development process and relations with culture and society of each academic discipline.	Being able to understand, deeply consider and explain construction and development process and relations with culture and society of each academic discipline.	Being able to understand and explain construction and development process and relations with culture and society of each academic discipline.	Being able to understand construction and development process and relations with culture and society of each academic discipline.
Abilities and Skills	(1)	Ability to formulate and solve physical problems.	1. Being able to assume appropriate physical principles. 2. Being able to set up models and assume quantities to solve issues. 3. Being able to release results based on clear hypotheses and similarities.	1. Being able to assume appropriate physical principles. 2. Being able to set up models to solve issues. 3. Being able to release results based on hypotheses and similarities.	To be able to formulate and solve physical problems.
	(2)	Mathematical ability to describe physical items.	1. Being able to correctly understand the role of approximation and meaning of mathematical modeling. 2. Being able to critically compare experiments, observation and other objective facts to model calculating results.	1. Being able to understand the role of approximation and meaning of mathematical modeling. 2. Being able to compare experiments, observation and other objective facts to model calculating results.	To be able to understand the basic mathematics required for describing physics.
	(3)	The ability・skills to compile research and experiment results and solution to given issues into report.	1. Being able to find solution of issues by understanding the concepts making use of some appropriate documents facilities and to integrate them into reports. 2. Being able to select appropriate ways for data analysis. 3. Being able to appropriately assess errors and accuracy in analysis. 4. Being able to relate their own results acquired as a result of the assessment to physical theory.	1. Being able to find solution of issues making use of some appropriate documents facilities and to integrate them into reports. 2. Being able to conduct appropriate ways for data analysis. 3. Being able to appropriately assess errors and accuracy of analysis. 4. Being able to lead conclusion from their own study.	1. Being able to carry out research and experiments and to integrate them into reports. 2. Being able to find out a solution toward given challenges.

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
	(4)	Acquisition of understanding of the principles, research methods and skills of physics.	1. Being able to understand principles of physical experiments and detailed ways and procedures to get correct data. 2. Having acquired experimental technique to develop the experiments. 3. Being able to analyze experimental data appropriately, estimate errors correctly and deepen the consideration to the results accurately.	1. Being able to correctly understand principles of physical experiments and detailed ways and procedures. 2. Having acquired experimental technique to get accurate experimental results. 3. Being able to analyze experimental data, estimate errors and deepen the consideration to the results.	1. Being able to understand principles of physical experiments and to consider detail ways and procedures to get accurate experimental data. 2. Having acquired experimental technique to develop experiments. 3. Being able to analyze experimental data appropriately, estimate errors correctly and consider the results.
Comprehensive Abilities	(1)	Problem-solving ability ・ability of research	1. Being able to find out specific solutions to not only physics but also other kinds of issues. 2. Being able to tackle endless issues. 3. Being able to specify the cores of issue and turn details of issues into formulation. 4. Being able to understand that there are several approaches to get better solutions.	1. Being able to find out specific solutions to issues of physics. 2. Being able to turn details of issues into formulation. 4. Being able to understand that there are several approaches to get better solutions.	1. Being able to find out correct solutions to issues of physics. 2. Being able to turn issues into formulation.
	(2)	Communication skills	1. Being able to listen to others opinions carefully and to make logical statements. 2. Being able to read, appropriately integrate and write down necessary documents. 3. Being able to clearly make verbal or paper announcement on intricate information.	1. Being able to listen to others opinions carefully and to make statements. 2. Being able to read, integrate and write down documents. 3. Being able to make verbal or paper announcement on intricate information.	1. Being able to listen to others opinions and to make statements. 2. Being able to read and write down documents. 3. Being able to make verbal or paper announcement on information.
	(3)	The capacity of analysis and IT literacy	1. Being able to pay attention to detail phenomena and to organize and integrate complicated thoughts. 2. Being able to correctly use technical and technological terms and to build up logical discussion. 3. Bing able to use programing languages or other various kinds of software of analysis or graphic and to operate computers and networks	1. Being able to pay attention to phenomena and to organize and integrate their thoughts. 2. Being able to use technical and technological terms and to build up logical discussion. 3. Bing able to use programing languages or other basic software of analysis or graphic and to operate computers and networks	1. Being able to organize and integrate concepts. 2. Being able to use technical and technological terms and to build up discussion. 3. Bing able to use basic software and to operate computers.
	(4)	Fitness and health promotion	Through practice of sports being able to understand importance of manners and cooperation, and to explain them and work on health promotion and fitness.	Through practice of sports being able to understand importance of manners and cooperation, and to explain them.	Through practice of sports being able to understand manners and cooperation.

Placement of Liberal Arts Education in the Major Program

The basic subjects are provided for developing the fundamentals of knowledge and understanding (understanding of the role of physics), skills and techniques (mathematical ability), and the foundation of skills and techniques (experiment planning ability). The subjects of Peace Science Courses and Basic Courses in University Education are provided for developing skills and techniques (ability in formulating and problem solving) from a diverse outlook regarding human beings and society, and for establishing a foundation of general abilities (communication ability). The common subjects (such as foreign language subjects) are provided for developing knowledge and understanding (ability in English) and establishing a foundation of general intelligence (analytical ability and skills related to information technology).

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)		(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)		
					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					30	1							35	1					35	1					100
Liberal Arts Education	Area Courses	8	Elective/ required	1～4							100	1																	100
Liberal Arts Education	Basic English Usage I	1	Required	1					100	1																			100
Liberal Arts Education	Basic English Usage II	1	Required	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	Free elective	1					100	1																			100
Liberal Arts Education	Foreign Languages: Basic Studies II	1	Free elective	1					100	1																			100
Liberal Arts Education	Foreign Languages: Basic Studies III	1	Free elective	2					100	1																			100
Liberal Arts Education	Foreign Languages: Basic Studies IV	1	Free elective	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	Ground zero programming	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	0	Free elective	1～2																									100	1	100
Liberal Arts Education	Social Cooperation Courses	0	Free elective	1～2																	100	1							100
Liberal Arts Education	Calculus I	2	Required	1											100	1													100
Liberal Arts Education	Calculus II	2	Required	2											100	1													100
Liberal Arts Education	Linear Algebra I	2	Required	1											100	1													100
Liberal Arts Education	Linear Algebra II	2	Required	2											100	1													100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics I	2	Required	3													50	1	50	1									100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics II	2	Required	3													50	1	50	1									100
Specialized Education	Introduction to Mathematics	2	Elective/ required	1							100	1																	100
Specialized Education	Introduction to Information Mathematics	2	Elective/ required	2							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)		(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)		
					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	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 A	2	Elective/ required	1							100	1															100
Specialized Education	Introduction to Earth and Planetary Sciences B	2	Elective/ required	2							100	1															100
Specialized Education	English for Physics	2	Elective/ required	3			50	1	50	1																	100
Specialized Education	Mechanics A	2	Required	1	100	1																					100
Specialized Education	Mechanics B	2	Required	2	100	1																					100
Specialized Education	Exercises in Mechanics	2	Required	2									100	1													100
Specialized Education	Mathematics for Physics B	2	Required	2											100	1											100
Specialized Education	Analytical Mechanics	2	Required	3	100	1																					100
Specialized Education	Thermodynamics Mechanics	2	Required	3	100	1																					100
Specialized Education	Electromagnetism Ⅰ	2	Required	3	100	1																					100
Specialized Education	Exercises in Electromagnetism	2	Required	3									100	1													100
Specialized Education	Mathematics for Physics C	2	Required	3											100	1											100
Specialized Education	Electromagnetism Ⅱ	2	Required	4	100	1																					100
Specialized Education	Quantum Mechanics Ⅰ	3	Required	4	100	1																					100
Specialized Education	Mathematics for Physics D	2	Required	4											100	1											100
Specialized Education	Quantum Mechanics Ⅱ	2	Required	5	100	1																					100
Specialized Education	Exercises in Quantum Mechanics	2	Required	5									100	1													100
Specialized Education	Statistical Mechanics Ⅰ	2	Required	5	100	1																					100
Specialized Education	Statistical Mechanics Ⅱ	2	Required	6	100	1																					100
Specialized Education	Exercises in Statistical Mechanics	2	Required	6									100	1													100
Specialized Education	Exercises of Physics	2	Free elective	1									100	1													100
Specialized Education	Mathematics for Physics A	2	Free elective	1											100	1											100
Specialized Education	Introduction of Physics	2	Free elective	2	100	1																					100
Specialized Education	Exercise in Electromagnetism and Quantum Mechanics	2	Free elective	4									100	1													100
Specialized Education	Computational Physics	2	Free elective	4																					100	1	100
Specialized Education	Physics Internship	1	Free elective	3																			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)		(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)		
					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	Experimental Methods in Physics	2	Required	4													50	1	50	1									100
Specialized Education	Laboratory in Physics Ⅰ	3	Required	5													35	1	35	1	30	1							100
Specialized Education	Laboratory in Physics Ⅱ	3	Required	6													35	1	35	1	30	1							100
Specialized Education	Physics Seminar	3	Required	7																			50	1	50	1			100
Specialized Education	Special Study for Graduation A	4	Required	7													25	1			25	1	25	1	25	1			100
Specialized Education	Special Study for Graduation B	4	Required	8													25	1			25	1	25	1	25	1			100
Specialized Education	Advanced Mathematics	2	Elective/ required	5							100	1																	100
Specialized Education	Advanced Physics	2	Elective/ required	4			100	1																					100
Specialized Education	Advanced Chemistry	2	Elective/ required	6							100	1																	100
Specialized Education	Advanced Biology	2	Elective/ required	5							100	1																	100
Specialized Education	Advanced Earth and Planetary Science	2	Elective/ required	6							100	1																	100
Specialized Education	Structural and Physical Properties of Solid	2	Elective/ required	5			100	1																					100
Specialized Education	Theory of Relativity	2	Elective/ required	5			100	1																					100
Specialized Education	Applied Electromagnetic Mechanics	2	Elective/ required	5			100	1																					100
Specialized Education	Molecular Physics	2	Elective/ required	6			100	1																					100
Specialized Education	Quantum Mechanics Ⅲ	2	Elective/ required	6			100	1																					100
Specialized Education	Solid State Physics Ⅰ	2	Elective/ required	6			100	1																					100
Specialized Education	Nuclear and Particle Physics	2	Elective/ required	5 ~~6~~			100	1																					100
Specialized Education	Astrophysics	2	Elective/ required	6			100	1																					100
Specialized Education	Mechanics of Continuous Media	2	Elective/ required	6			100	1																					100
Specialized Education	Relativistic Quantum Mechanics	2	Elective/ required	7			100	1																					100
Specialized Education	Solid State Physics Ⅱ	2	Elective/ required	7			100	1																					100

Curriculum Map of Physics

Sheet4

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	Knowledge and understanding of physical mathematics, mechanics, electromagnetism, thermodynamics, statistical mechanics and quantum mechanics.	Mechanics A(◎)	Mechanics B(◎)	Analytical Mechanics(◎)	Electromagnetism Ⅱ(◎)	Quantum Mechanics Ⅱ(◎)	Statistical Mechanics Ⅱ(◎)		
			Introduction of Physics(△)	Thermodynamics Mechanics(◎)	Quantum Mechanics Ⅰ(◎)	Statistical Mechanics Ⅰ(◎)			
				Electromagnetism Ⅰ(◎)					
	Knowledge and understanding of specialized field of elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics.			English on Physics(○)	Advanced Physics(○)	Structural and Physical Properties of Solid(○)	Molecular Physics(○)	Relativistic Quantum Mechanics(○)	
						Theory of Relativity(○)	Quantum Mechanics Ⅲ (○)	Solid State Physics Ⅱ(○)	
						Applied Electromagnetic Mechanics(○)	Solid State Physics Ⅰ(○)		
						Nuclear and Particle Physics(○)			
							Astrophysics(○)		
							Mechanics of Continuous Media(○)		
	Acquiring science english・foreign language that you can practice reading comprehension, journal publication, conference presentation.	Communication ⅠA(◎)	Communication ⅡA(◎)						
		Communication ⅠB(◎)	Communication ⅡB(◎)						
		Basic English Usage Ⅰ(◎)	Basic English Usage Ⅱ(◎)						
		Foreign Languages: Basic Studies Ⅰ (△)	Foreign Languages: Basic Studies Ⅲ (△)	English for Physics(○)					
		Foreign Languages: Basic Studies Ⅱ (△)	Foreign Languages: Basic Studies Ⅳ (△)						
		Introductory Seminar for First-Year Students(◎)							
	The knowledge and understanding on construction and development process and relations with culture and society of each academic discipline.	Area Courses(○)	Area Courses(○)	Area Courses(○)	Area Courses(○)				
		Introduction to Chemistry A(○)	Introduction to Chemistry B(○)						
		Introduction to Biological Sciences A (○)	Introduction to Biological SciencesB (○)						
		Introduction to Earth and Planetary Sciences A(○)	Introduction to Earth and Planetary Sciences B(○)						
		Introduction to Mathematics(○)	Introduction to Information Mathematics(○)						
		Peace Science Courses(○)							
		Introduction to University Education (◎)							
Abilities and Skills	Ability to formulate and solve physical problems.	Exercises of Physics(△)	Exercises in Mechanics(◎)	Exercises in Electromagnetism(◎)	Exercise in Electromagnetism and Quantum Mechanics(△)	Exercises in Quantum Mechanics(◎)	Exercises in Statistical Mechanics(◎)		
	Mathematical ability to describe physical items.	Mathematics for Physics A(△)	Mathematics for Physics B(◎)	Mathematics for Physics C(◎)	Mathematics for Physics D(◎)				
		Calculus Ⅰ(◎)	Calculus Ⅱ(◎)						
		Linear Algebra Ⅰ(◎)	Linear Algebra Ⅱ(◎)						
	The ability・skills to compile research and experiment results and solution to given issues into report.	Introductory Seminar for First-Year Students(◎)		Experimental Methods and Laboratory Work in Physics Ⅰ(◎)	Experimental Methods in Physics(◎)	Laboratory in Physics Ⅰ(◎)	Laboratory in Physics Ⅱ(◎)	Special Study for Graduation A(◎)	Special Study for Graduation B(◎)
				Experimental Methods and Laboratory Work in Physics Ⅱ(◎)					
	Acquisition of understanding of the principles, research methods and skills of physics.			Experimental Methods and Laboratory Work in Physics Ⅰ(◎)	Experimental Methods in Physics(◎)	Laboratory in Physics Ⅰ(◎)	Laboratory in Physics Ⅱ(◎)		
				Experimental Methods and Laboratory Work in Physics Ⅱ(◎)					
Comprehensive Abilities	Problem-solving ability ・ability of research	Social Cooperation Courses(△)	Social Cooperation Courses(△)			Laboratory in Physics Ⅰ(◎)	Laboratory in Physics Ⅱ(◎)	Special Study for Graduation A(◎)	Special Study for Graduation B(◎)
	Communication skills	Introductory Seminar for First-Year Students(◎)		Physics Internship(△)				Special Study for Graduation A(◎)	Special Study for Graduation B(◎)
	The capacity of analysis and IT literacy	Introduction to Information and Data Sciences(◎)	Intelligence and Computer(○)		Computational Physics(△)			Special Study for Graduation A(◎)	Special Study for Graduation B(◎)
		Computer Programming(○)	Ground zero programming(○)					Exercises of Physics (◎)	
			Fundamental Date Science(○)						
	Fitness and health promotion	Health and Sports Courses(△)	Health and Sports Courses(△)						
			Liberal Arts Education Subjects	Basic Specialized Subjects	Specialized Education Subjects	Graduation Thesis	(◎)Required	(○)Elective/required	(△)Free elective