For entrants in AY 2024

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

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

n 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

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

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.

From "Peace Science Courses"	Each 2	Elective/required	○			
Introduction to University Education	2	Required	②			
Introductory Seminar for First-Year Students	2	Required	②			
Advanced Seminar	1	Free elective	○	○		
From "Area Courses" (Note 3)	1 or 2	Elective/required	○	○	○	○
Basic English Usage I	1		①			
Basic English Usage II	1			①		
Communication IA	1		①			
Communication IB	1		①			
Communication IIA	1			①		
Communication IIB	1			①		
Foreign Languages: Basic Studies Ⅰ	1		○			
Foreign Languages: Basic Studies Ⅱ	1		○			
Foreign Languages: Basic Studies Ⅲ	1			○		
Foreign Languages: Basic Studies Ⅳ	1			○		
Introduction to Information and Data Sciences	2	Required	②			
Computer Programming	2		○	○		
Intelligence and Computer	2			○		
Starting Programming from Scratch	2			○		
Fundamental Date Science	2			○		
From "Health and Sports Courses"	1 or 2	Elective/required	○	○		
From "Social Cooperation Courses"	1 or 2					

	Introduction to Mathematics	2		○							
	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			○						
	Mechanics A	2		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 11)	2		○							
	Mathematics for Physics A (Note 11)	2		○							
	Introduction of Physics (Note 11)	2			○						
	Exercise in Electromagnetism and Quantum Mechanics (Note 11)	2					○				
	Computational Physics (Note 11)	2					○				
	Electronics	2					○				
	English for Physics	2				○					
	Physics Internship	1				○					
	Experimental Methods in Physics	2					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
	Advanced Mathematics	2						○			
	Advanced Physics	2					○				
	Advanced Chemistry	2	Elective/required						○		
	Advanced Biology	2						○			
	Advanced Earth and Planetary Science	2							○		
	At least 1 subject (2credits) from the five subjects above										
	Theory of Relativity	2						○			
	Nuclear and Particle Physics	2						○			
	Astrophysics	2							○		
	Experimental particle physics	2							○		
	Structural and Physical Properties of Solid	2						○			
	Molecular Physics	2							○		
	Solid State Physics Ⅰ	2	Elective/required						○		
	Solid State Physics Ⅱ	2								○	
	Applied Electromagnetic Mechanics	2						○			
	Mathematics for Physics E (Group Theory)	2						○			
	Mechanics of Continuous Media	2							○		
	Quantum Mechanics Ⅲ	2							○		
	Relativistic Quantum Mechanics	2								○	
	"Special Lectures in Physics" (Note 12)			○	○	○	○	○	○	○	○
	At least 5 subjects (10credits) from the fourteen subjects above										
	"Basic Specialized Subjects" and "Specialized Subjects" offered by other programs of School of Science		Free elective	○	○	○	○	○	○	○	○
Any subject		12	(Note 13)	○	○	○	○	○	○	○	○
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

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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(◎)	Electronics(△)				
	Knowledge and understanding of specialized field of elementary particle physics, cosmophysics, astrophysics, solid-state physics, condensed matter physics and radiation physics.			English for 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(○)	Experimental particle physics(○)		
						Mathematics for Physics E (Group Theory)(○)	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(◎)							
		Advanced Seminar (△)	Advanced Seminar (△)						
	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(◎)
		Advanced Seminar (△)	Advanced Seminar (△)	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(◎)	Electronics(△)				
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(◎)
		Advanced Seminar (△)	Advanced Seminar (△)						
	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(○)	Starting Programming from Scratch (○)					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