# 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

- O Educational personnel certification
  - 1: Type 1 License for Junior High School Teacher (Science)
  - 2: Type 1 License for High School Teacher (Science)
- O 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	Converted
achievement	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

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

# 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

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

<sup>\*</sup> Refer to the curriculum map in Attachment 4.

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 2024)

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)

												in wh					
Туре	,		S	Subject type	-	ired No. of	Class subjects, etc.	No. of	Type of course	1st g	rade	2nd g	grade	3rd g	rade	4th g	grade
- J p			_	subject type	,	credits	Class subjects, etc.	credits	registration	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
										1	2	3	4	5	6	7	8
			Peace	Science Courses		2	From "Peace Science Courses"	Each 2	Elective/required	0							
	s in cation	Intro	oducti	on to University Education		2	Introduction to University Education	2	Required	2							
	Course sity Edu	Intro	luctory	Seminar for First-Year Students		2	Introductory Seminar for First-Year Students	2	Required	2							
	Basi Uriver		Adva	nced Seminar (Note 2)		(0)	Advanced Seminar	1	Free elective	0	0						
				Area Courses		8	From "Area Courses" (Note 3)	1 or 2	Elective/required	0	0	0	0				
				Basic English Usage		2	Basic English Usage I	1	Required	1							
			e 4)	Dasic Eligiisii Osage		2	Basic English Usage II	1	Required		1						
		S	English (Note 4 (Note 5)	Communication I		2	Communication IA	1	Required	1							
		ıage	lish (No	Communication 1		2	Communication IB	1	Required	1							
		angr	Eng	Communication II	6	2	Communication IIA	1	Required		1						
		gn L		Communication II	ь	2	Communication IIB	1	rtequireu		1						
ects	jects	Foreign Languages	Non-	-English Foreign Languages			Foreign Languages: Basic Studies I	1		0							
Arts Education Subjects	Common Subjects	ц		German, French, Spanish, sian, Chinese, Korean and		(0)	Foreign Languages: Basic Studies II	1	Free elective	0							
ion	mon		Itus	Arabic)		(0)	Foreign Languages: Basic Studies III	1	. Tree elective		0						
ucat	Com			(Note 5) (Note 6)			Foreign Languages: Basic Studies IV	1			0						
s Ed						2	Introduction to Information and Data Sciences	2	Required	2							
Art							Computer Programming	2		0	0						
Liberal		Infor	matio	n and Data Science Courses	4	2	Intelligence and Computer	2	Elective/required		0						
Lib						2	Starting Programming from Scratch	2	Elective/ required		0						
							Fundamental Date Science	2			0						
		Hea	lth an	d Sports Courses (Note 7)		(0)	From "Health and Sports Courses"	1 or 2	Elective/required	0	0						
		Soc	ial Co	operation Courses (Note 8)		(0)	From "Social Cooperation Courses"	1 or 2	Free elective	0	0						
							Calculus I	2		2							
							Calculus II	2			2						
						10	Linear Algebra I	2	Required	2							
			Fou	ndation Courses	10	10	Linear Algebra II	2	required		2						
							Experimental Methods and Laboratory Work in Physics I	1				1					
1							Experimental Methods and Laboratory Work in Physics II	1				1					
						(0)	From "Foundation Courses"	1  or  2	Free elective	0	0	0	0	0	0		
	То	tal(Li	beral	Arts Education Subjects)		34											

- (Note 1) The indicated semester represents that in which students typically take the subject. It is permitted to take the subject in the same (first or second) semester in the following year, however, it is required to confirm the details in syllabus for that academic year, because the subject might be provided in a different semester or term.
- (Note 2) The credit for "Advanced Seminar" is accepted as credit for the category of "Any subject".
- (Note 3) It is required to earn 4 credits in "Human & Social Science Subjects" and 4 credits in "Natural Science Subjects". Students who want to acquire an educational personnel certification must take the subject "Japanese Constitution" in the "Human & Social Science Subjects."

  Credits earned through the subject "Advanced English for Communication", "Foreign Languages: Intensive Studies" and "Overseas Language Seminar (German, French, Spanish, Russian, Chinese, and Korean)" in "Foreign Languages" are accepted as the credits required for "Human & Social Science Subjects".

- You can transfer the credits acquired by completing courses of self-learning "Online English Seminar I, II, III" are accepted as the credit for the subject "Communication I and II". Excessive number of credits earned in the "Area Courses" and "SocialCooperation Courses" in which the language of Instruction is in English is accepted as credits for the graduation requirement for English language courses.
- Credit Approval for Foreign Language Proficiency Tests, etc.: For details, please refer to the sections relating to the English of Liberal Arts Education and "Handling of Credit Approval for Foreign Language Proficiency Tests, etc." in the Student Handbook.
- (Note 6) The credit(s) for "Foreign Languages: Basic Studies I, II, III and IV" is (are) accepted as a credit (credits) for the category of "Any subject" up to 2 credits in total. · Arabic course is limited to I and II.
- Students are recommended to take the "Health and Sports Courses". The credit for "Health and Sports Courses" is accepted as credit for the category of "Any Subject".
- (Note 8) The credit for "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 9] 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 9)
- (Note 10) Any credit earned that exceeds 4 credits is accepted as credit for the category of "Any subject".
- It is strongly recommended to take the subject as a requested subject for Physics Program.
- 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.
- 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).
  - 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 1, 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)

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		Regi	uired l	No of		No. of	Type of	1et o	(*The		<sub>gure me</sub> grade		ester) (Ne grade		grade
Туре	Subject type		credit		Class subjects, etc.	credits	course	Spring		Spring		Spring	Fall	Spring	
							registration	1	2	3	4	5	6	7	8
					Introduction to Mathematics	2		0			4		0	<u>'</u>	0
					Introduction to Information Mathematics	2			0						
					Introduction to Chemistry A	2		0							
					Introduction to Chemistry B	2			0						
				4	Introduction to Biological Sciences A	2	Elective/required	0							
			(Not	e 10)	Introduction to Biological Sciences B	2			0						
					Introduction to Earth and Planetary Sciences A	2		0							
					Introduction to Earth and Planetary Sciences B	2			0						
					2 subjects (4 credits) from the eight subjects abo							l	l	<u> </u>	ļ
					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					
	D . C . P . LC				Exercises in Electromagnetism	2				2					
	Basic Specialized Subjects		3	35	Mathematics for Physics C	2	Required			2					
					Electromagnetism II	2					2				
					Quantum Mechanics I	3	1				3				ĺ
					Mathematics for Physics D	2	1				2				ĺ
					Quantum Mechanics II	2	1					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		0							
so.					Mathematics for Physics A (Note 11)	2		0							
Specialized Education Subjects					Introduction of Physics (Note 11)	2			0						
Suk					Exercise in Electromagnetism and Quantum Mechanics (Note 11)	2	Free elective				0				
tion		82			Computational Physics (Note 11)	2	riee elective				0				
duca		(Note			Electronics	2					0				
d E		9)			English for Physics	2				0					
alize					Physics Internship	1				0					
peci					Experimental Methods in Physics	2					2				
S.					Laboratory in Physics I	3						3			
			١.,	19	Laboratory in Physics II	3	Required						3		
			,	IJ	Physics Seminar	3	Required							3	
					Special Study for Graduation A	4								4	
					Special Study for Graduation B	4									4
					Advanced Mathematics	2						0			
					Advanced Physics	2					0				
			2 or	more	Advanced Chemistry	2	Elective/required						0		
			201		Advanced Biology	2						0			
					Advanced Earth and Planetary Science	2							0		
					At least 1 subject (2credits) from the five subjec		T					1			
				_	Theory of Relativity	2						0			_
				2 or	Nuclear and Particle Physics	2						0			_
	Specialized Subjects			more	Astrophysics	2							0		_
					Experimental particle physics	2							0		
				2	Structural and Physical Properties of Solid	2						0	_		1
				or	Molecular Physics	2						<u> </u>	0	ļ	<u> </u>
			10	more	Solid State Physics I	2	Elective/required						0		1
			or more		Solid State Physics II	2						<u> </u>		0	1
					Applied Electromagnetic Mechanics	2						0			1
				2	Mathematics for Physics E (Group Theory)	2						0		ļ	<u> </u>
				or more	Mechanics of Continuous Media	2						<u> </u>	0	ļ	<u> </u>
					Quantum Mechanics III	2						<u> </u>	0		<u> </u>
					Relativistic Quantum Mechanics	2								0	L.
					"Special Lectures in Physics" (Note 12)	<u> </u>	1	0	0	0	0	0	0	0	C
					At least 5 subjects (10credits) from the fourteen	subjects	above				1	1			1
					"Basic Specialized Subjects" and "Specialized Subjects" offered by other programs of School of	-	Free elective	0	0	0	0	0	0	0	С
		1			Science					0	-	<b> </b>		0	0
	Any subject		12		(Note 13)			0	0		0	0	0		

# Academic achievements of Physics Program

Relationships between the evaluation items and evaluation criteria

		Academic achievements		Evaluation criteria	
		Evaluation items	Excellent	Very Good	Good
18	(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.
Jnderstandir	(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.	solid-state physics, condensed matter physics and	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.
Knowledge and Understanding	(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.
	(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.	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.
xills	(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.	Being able to understand the role of approximation and meaning of mathematical modeling.     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.
Abilities and Skills	(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 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.	<ol> <li>Being able to carry out research and experiments and to integrate them into reports.</li> <li>Being able to find out a solution toward given challenges.</li> </ol>

		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.
	( I )	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.
nsive Abilities	(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.
Comprehensive	(3) The capacity of analysis and literacy	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	Being able to organize and integrate concepts.     Being able to use technical and technological terms and to build up discussion.     Being 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

																	on iter												Total
						Kı	nowled	lge and	l Unde	rstandi	ing				Ab	ilities	and Sk	xills					Comp	rehen	sive A	oilities			weighte
Subject			Type of course		(	1)	(	2)	(:	3)	(	4)	(	1)	(2	2)	(:	3)	(4	4)	(	1)	()	2)	(	3)	(4	4)	d values
Classification	Subject Name	Credits	registrat	Grade	Weighted values of	Weighted	Weighted values of		Weighted values of	Weighted	Weighted values of	Waightad	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	evaluati										
			ion		evaluatio	values of	on																						
					n items in the	evaluatio n items	items in																						
Libonal Anta			m · · ·		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		the
Liberal Arts Education	Peace Science Courses	2	Elective/ required	1							100	1																	100
Liberal Arts	Introduction to	2	Required	1							100	1																	100
Education Liberal Arts	University Education Introductory Seminar for	2	D i	1					20	1							25	1					25	1					100
Education	First-Year Students		Required	1					30	1							35	1	ļ				35	1				ļ	100
Liberal Arts Education	Advanced Seminar	1	Free elective	1~2					30	1							35	1					35	1					100
Liberal Arts	Area Courses	8	Elective/	1~4							100	1																	100
Education Liberal Arts	D : D !: 1 II I	1	required	,					100	1																			100
Education	Basic English Usage I	1	Required	1					100	1									ļ									ļ	100
Liberal Arts Education	Basic English Usage II	1	Required	2					100	1																			100
Liberal Arts	Communication I	2	Required	1					100	1																			100
Education Liberal Arts	Communication II	2	Dominod	2					100	1																			100
Education			Required	2	-				100	1																			
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	1					100	1																			100
Liberal Arts	Foreign Languages:	1	Free	2					100																				100
Education	Basic Studies III	1	elective						100	1									ļ									ļ	1
Liberal Arts Education	Foreign Languages: Basic Studies <b>IV</b>	1	Free elective	2					100	1																			100
Liberal Arts Education	Introduction to Information and Data Sciences	2	Required	1																					100	1			100
Liberal Arts	Computer Programming	2	Elective/	1																					100	1			100
Education Liberal Arts	Intelligence and		required Elective/																						_			-	
Education	Computer	2	required	2																					100	1			100
Liberal Arts Education	Starting Programming from Scratch	2	Elective/ required	2																					100	1			100
Liberal Arts	Fundamental Date	2	Elective/	2																					100	1			100
Education	Science		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	Linear Algebra II	2	Required	2											100	1													100
Education	Experimental Methods and			<u> </u>	+										100	-													100
Liberal Arts Education	Laboratory Work in Physics I	2	Required	3													50	1	50	1									100
Liberal Arts	Experimental Methods and Laboratory Work in Physics	2	Required	3													50	1	50	1									100
Education Specialized	II Introduction to	2	Elective/	1							100	1																	100
Education Specialized	Mathematics Introduction to		required Elective/		1							1																	
Education	Information Mathematics	2	required	2							100	1																	100

															Е	valuati	ion ite	ms											Total
						Kı	nowled	lge and	Unde	rstand	ing				Ab	oilities	and Sl	kills					Comp	orehen	sive Al	oilities			weighte
Subject	0.11		Type of course		(	1)	(	2)	(	3)	(-	4)	(	(1)	(	2)	(	(3)	(.	4)	(	1)	(	2)	()	3)	(	4)	d values of
Classification	Subject Name	Credits	registrat ion	Grade	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject		Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject		Weighted values of evaluatio n items in the subject		Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	evaluati on items in the
Specialized Education	Introduction to Chemistry A	2	Elective/ required	1							100	1																	100
Specialized	Introduction to	2	Elective/	2							100	1																	100
Education Specialized	Chemistry B Introduction to		required Elective/																										
Education	Biological Sciences A	2	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	2	Elective/ required	2							100	1																	100
Specialized Education	English for Physics	2	Free elective	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	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							<u> </u>		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	Electronics	2	Free elective	4	80	1													20	1									100

															E.	valuati	on iter	ms										Total
						Kr	nowled	ge and	l Unde	rstand	ing				Ab	ilities	and Sk	rills					Comp	rehen	sive Al	oilities		weighte
Subject			Type of			1)	(2	2)	()	3)	(	4)	(1	1)	(:	2)	(;	3)	(.	4)	(	1)	(:	2)	(	3)	(4)	d values
Classification	Subject Name	Credits	course registrat	Grade			Weighted		Weighted		Weighted		Weighted		Weighted		Weighted		Weighted		Weighted		Weighted		Weighted		Weighted	evaluati
			ion		values of evaluatio	Weighted values of	evaluatio	Weighted values of	evaluatio		values of evaluatio	values of	evaluatio	Weighted values of	values of evaluatio	values of	values of evaluatio	values of	evaluatio	Weighted values of	evaluatio		evaluatio	Weighted values of	values of evaluatio	Weighted values of	values of Weighte evaluatio values of	f on
					n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in the	evaluatio n items	n items in evaluati the n items	items in
					subject	ii reemb	subject	ii icemo	subject	ii reeiiib	subject	n nomo	subject	ii itomo	subject	II ROMO	subject	n reemo	subject	II Icomo	subject	ii icomo	subject	ii icomo	subject	ii iccino	subject	the
Specialized Education	Physics Internship	1	Free elective	3																			100	1				100
Specialized	Experimental Methods in	2	Required	4													50	1	50	1								100
Education Specialized	Physics		rtequired															-		1								
Education	Laboratory in Physics I	3	Required	5													35	1	35	1	30	1						100
Specialized	Laboratory in Physics II	3	Required	6													35	1	35	1	30	1						100
Education Specialized			1															_		_		_	= 0	_	=0			
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	Special Study for	4	Required	8													25	1			25	1	25	1	25	1		100
Education	Graduation B	4		0													20	1			20	1	20	1	20	1		100
Specialized Education	Advanced Mathematics	2	Elective/ required	5							100	1																100
Specialized	Advanced Physics	2	Elective/	4			100	1																				100
Education Specialized	-		required Elective/				100	1	1														-					
Education	Advanced Chemistry	2	required	6							100	1																100
Specialized	Advanced Biology	2	Elective/	5							100	1																100
Education Specialized	Advanced Earth and	2	required Elective/	0							100	,																100
Education	Planetary Science	2	required	6							100	1																100
Specialized Education	Theory of Relativity	2	Elective/ required	5			100	1																				100
Specialized	Nuclear and Particle	2	Elective/	5			100	1																				100
Education Specialized	Physics	2	required				100	1																				100
Education	Astrophysics	2	Elective/ required	6			100	1																				100
Specialized	Experimental particle	2	Elective/	6			100	1																				100
Education Specialized	physics Structural and Physical		required Elective/																									
Éducation	Properties of Solid	2	required	5			100	1																				100
Specialized Education	Molecular Physics	2	Elective/ required	6			100	1																				100
Specialized	Solid State Physics I	2	Elective/	6			100	1																				100
Education	Solid State Physics 1		required	0			100	1																				100
Specialized Education	Solid State Physics II	2	Elective/ required	7			100	1																				100
Specialized	Applied Electromagnetic	2	Elective/	5			100	1																				100
Education Specialized	Mechanics Mathematics for Physics		required Elective/					1																				
Education	E (Group Theory)	2	required	5			100	1							<u> </u>		<u> </u>								<u> </u>			100
Specialized	Mechanics of	2	Elective/	6			100	1																				100
Education Specialized	Continuous Media		required Elective/																				<del>                                     </del>					
Education	Quantum Mechanics III	2	required	6			100	1																				100
Specialized Education	Relativistic Quantum Mechanics	2	Elective/ required	7			100	1																				100
Education	Mechanics	1	required	·	1		1				I		1		l		l		1		·		i		l			

	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 of physical	Mechanics A(⊚)	Mechanics B(⊚)	Analytical Mechanics (©)	Electromagnetism II(©)	Quantum Mechanics II(©)	Statistical Mechanics II(©)		
	mathematics, mechanics,		Introduction of Physics( $\Delta$ )	Thermodynamics Mechanics (©)	Quantum Mechanics I(③)	Statistical Mechanics I(©)			
	electromagnetism, thermodynamics, statistical mechanics and quantum mechanics.			Electromagnetism I(©)	$Electronics(\Delta)$				
				English for Physics (△)	Advanced Physics(O)	Structural and Physical Properties of Solid(O)	Molecular Physics(O)	Relativistic Quantum Mechanics(O)	
	Knowledge and understanding of					Theory of Relativity(O)	Quantum Mechanics II (O)	Solid State Physics II(O)	
	specialized field of elementary particle					Applied Electromagnetic Mechanics(O)	Solid State Physics I(O)		
	physics, cosmophysics, astrophysics, solid-state physics, condensed matter					Nuclear and Particle Physics(O)	Experimental particle physics(O)		
ng.	physics and radiation physics.					Mathematics for Physics E (Group	Astrophysics(O)		
and						Theory) (O)	Mechanics of Continuous Media(O)		
Understanding		Communication IA(©)	Communication IIA(©)						
Jud		Communication IB(©)	Communication IIB(©)						
and L	Acquiring science english foreign								
	language that you can practice reading	Basic English Usage I(⊚) Foreign Languages: Basic Studies I	Basic English Usage II(⊚)  Foreign Languages: Basic Studies III	5 F1 6 F1 1 (1)					
edg	comprehension, journal publication,	(△) Foreign Languages: Basic Studies II	(△) Foreign Languages: Basic Studies IV	English for Physics (Δ)					
Knowledge	conference presentation.	(△) Introductory Seminar for First-Year	(\(\Delta\))						
추		Students (©)							
		Advanced Seminar ( $\Delta$ )	Advanced Seminar ( $\Delta$ )						
		Area Courses(O)	Area Courses(O)	Area Courses(O)	Area Courses(O)				
		Introduction to Chemistry A(O)	Introduction to Chemistry B(O)						
	The knowledge and understanding on	Introduction to Biological Sciences A	Introduction to Biological SciencesB						
	construction and development process	Introduction to Earth and Planetary Sciences A(Q)	Introduction to Earth and Planetary Sciences B(Q)						
	and relations with culture and society of each academic discipline.	Introduction to Mathematics (O)	Introduction to Information Mathematics (O)						
	·	Peace Science Courses(O)	Mathematics (O)						
		Introduction to University Education							
	ALTER A COLUMN TO	(⊚) Exercises of Physics(△)	Exercises in Mechanics(©)	Exercises in Electromagnetism(©)	Exercise in Electromagnetism and	Exercises in Quantum	Exercises in Statistical		
	Ability to formulate and solve physical problems.	Excretises of Thyores (E)	Exercises in Medianics (@)	Excitored in Erectionagreeron(%)	Quantum Mechanics(△)	Mechanics (⊚)	Mechanics (◎)		
		Mathematics for Physics A(△)	Mathematics for Physics B(⊚)	Mathematics for Physics C(⊚)	Mathematics for Physics D(©)				
Skills	Mathematical ability to describe physical	Calculus I (  )	Calculus II (◎)						
S	items.	Linear Algebra I (©)	Linear Algebra II (◎)						
and	The ability skills to compile research and	Introductory Seminar for First-Year		Experimental Methods and Laboratory	Experimental Methods in				
Abilities	experiment results and solution to given	Students (©)		Work in Physics I (©)  Experimental Methods and Laboratory	Physics(⊚)	Laboratory in Physics I(⊚)	Laboratory in Physics II(⊚)	Special Study for Graduation A(⊚)	Special Study for Graduation B(⊚)
Ap	issues into report.	Advanced Seminar (Δ)	Advanced Seminar (△)	Work in Physics II (◎)					
	Acquisition of understanding of the principles, research methods and skills of			Experimental Methods and Laboratory Work in Physics I (©)	Experimental Methods in Physics(⊚)	Laboratory in Physics I(⊚)	Laboratory in Physics II(©)		
	physics.			Experimental Methods and Laboratory Work in Physics II (©)	Electronics ( $\Delta$ )				
	Problem-solving ability • ability of	Social Cooperation Courses( $\Delta$ )	Social Cooperation Courses( $\Delta$ )			Laboratory in Physics I(©)	Laboratory in Physics II(©)	Special Study for Graduation A(©)	Special Study for Graduation B(©)
	research					. , ,	, , ,		
Abilities		Introductory Seminar for First-Year Students (  )		Physics Internship(△)				Special Study for Graduation A(©)	Special Study for Graduation B(©)
.iie	Communication skills	Students (∅) Advanced Seminar (△)	Advanced Seminar (△)	Thysics internship (A)				opecial olday for dradadion A(@)	opecial occup for diaduation b(@)
		Introduction to Information and Data			Computational Physics (A)			Special Study for Creduction A(@)	Special Study for Ovaduation D(A)
ensi	The capacity of analysis and IT literacy	Sciences (©)	Intelligence and Computer(O)		Computational Physics (△)			Special Study for Graduation A(©)	Special Study for Graduation B(©)
Comprehensive	, , , , , , , , , , , , , , , , , , , ,	Computer Programming (O)	Starting Programming from Scratch (O)					Exercises of Physics (©)	
o mg			Fundamental Date Science(O)						
0	E3 11 10 2	Health and Sports Courses(△)	Health and Sports Courses(△)						
	Fitness and health promotion								
	•	ı	Liberal Arts Education Subjects	Basic Specialized Subjects	Specialized Education Subjects	Graduation Thesis	(⊚)Required	(O)Elective/required	( $\Delta$ )Free elective