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A. OBJECTIVES OF THE DEGREE PROGRAM

1. Vision and Mission of the Institution

Vision of Universitas Negeri Jakarta

"*Becoming a Reputable University in the Asian Region*"

Mission of Universitas Negeri Jakarta

"*Organizing the Tridharma of Higher Education that is Excellent and Useful for the Benefit of Humans*"

2. The Vision and Mission Objectives of Faculty

The vision of the Faculty of Mathematics and Natural Science

To become an excellent and competitive faculty in the field of Mathematics, Natural Sciences, Mathematics Education, and Natural Sciences Education at the ASIAN level based on faith and piety

Mission of Faculty of Mathematics and Natural Science

1. To produce graduates in the field of Mathematics and Natural Sciences education who are professional, able to utilize information and communication technology, have faith and piety, have entrepreneurial skills, according to stakeholder needs, and are able to compete at the ASEAN level.
2. To produce quality scientific works based on research results in the field of Mathematics and Natural Sciences and Mathematics and Natural Sciences education in accordance with the development of science and technology.
3. To produce works of community service in the field of Mathematics and Natural Sciences and Mathematics and Natural Sciences education that can be directly utilized by the community.
4. To establish mutually beneficial cooperation with partner institutions both from within and from abroad, especially those related to the development of FMIPA UNJ.

3. The Vision of Bachelor of Physics Program

Vision of Bachelor of Physics Program

Becoming a Study Program that excels in fundamental knowledge of material physics, instrumentation physics, and computational physics through collaboration with various institutions at the Asian level.

B. PROGRAM EDUCATIONAL OBJECTIVES (PEO)

The PEO of Bachelor of Physics Study Program provides the opportunity for graduates to be able to:

1. Master basic concepts and methodology of physics and apply it to a broader field by utilizing science and technology developments to discover solutions according to their field of work.
2. Expand their knowledge through further study of formal and informal higher education.
3. Collaborate actively and effectively in a team, communicate ideas, and have managerial skills on related fields.
4. Have creative, innovative, and adaptive personality towards the advancement of science and technology according to their field of work.

C. PROGRAM LEARNING OUTCOMES (PLO)

Learning Outcomes of Bachelor of Physics Study Program are presented in Table 1.1 The PLO's are classified into two areas of social competence and specialist competence.

Table 1.1 The PLO of Bachelor of Physics Study Program

Area	Code	Program Learning Outcome
Social Competences	PLO 1	Demonstrate a religious manner, uphold values of humanity andnationalism, and internalize the value of self-reliance, discipline, responsible, critical thinking, innovative, communicative, and collaborative in solving different problems.
	PLO 2	They are competent to work in team and independent, documented and analyze data to discover scientific assertions that correspond with standard scientific principles, communicateverbally and in writing, publish the paper, as well as super-vise and assess to establish accurate solutions.
Specialist Competencies	PLO 3	They are advanced knowledge of relevant specialized classicaltheoretical physics and modern physics using mathematical and computational concepts
	PLO 4	They are qualified to accomplish theoretical analysis byfundamental principles of physics and mathematical concepts to generate models or simulations that correspond to hypotheses
	PLO 5	They are capable to demonstrate by involve the fundamentalprinciples of physical measurement and scientific methodology to interpret data and formulate physics phenomena.
	PLO 6	They have acquired instrumentation and computational expertise in physics, synthesize and characterize material toexpand it to another field.
	PLO 7	They have advanced their knowledge in technology that usingphysics principle and employ physical concept to applied to relevant subject by utilize the development of science and technology in accordance with the field of work.
	PLO 8	They are competent to improve their knowledge and continue study to a higher level.

The relevance between PLO and PEO of the Bachelor of Physics Study Program is described in the matrix Figure 1.1

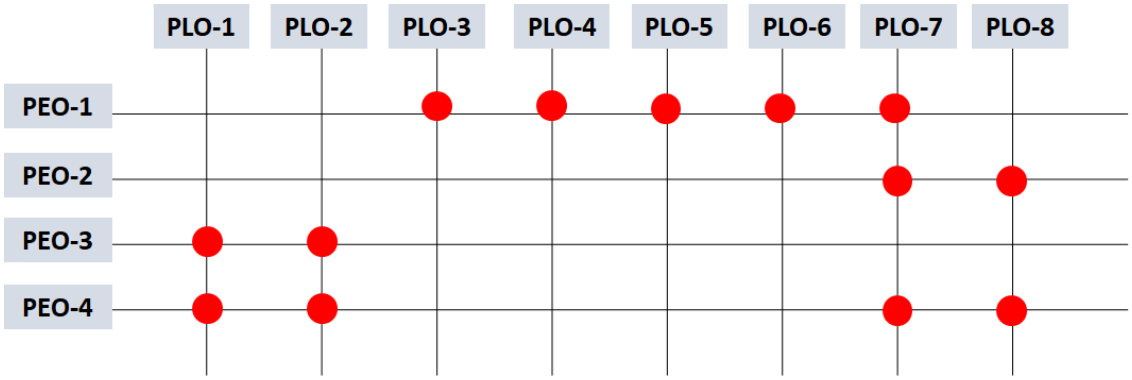

Figure 1. 1 Matrix of PLO and PEO of Bachelor of Physics Study Program

Subject-Specific Criteria (SSC) are developed based on the physics study program body of knowledge and its PLO classification. The SSC for the Bachelor of Physics Study Program graduates are stated in Table 1.2

Table 1. 2 SSC of Bachelor of Physics Study Program

SSC (Subject-Specific Criteria)		
Specialist Competences	SSC-1	They have sound knowledge of classical physics (mechanics, electrodynamics, thermodynamics, oscillations, waves and optics) and are familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid- state physics.
	SSC-2	They are familiar with important mathematical methods usedin physics and can use these to solve physics problems.
	SSC-3	They have an extensive understanding of the fundamental principles of physics, their inherent relation and mathematical formulation and, based on this, have acquired methods suitable for theoretical analysis, modelling and simulation of relevant processes
	SSC-4	They have applied their knowledge to physics problems in an exemplary manner and studied some areas in greater depth, thereby acquiring a first basis for problem solving competence.
	SSC-5	They have a basic capacity to comprehend physicsproblems. This will in general however not yet facilitate a deeper understanding of current research areas.
	SSC-6	They are therefore in a position to independently classify physics-based and to some extent also interdisciplinary problems that require a target-oriented and logic-based approach, and to analyse and/or solve them by using natural scientific and mathematical methods.
	SSC-7	They are familiar with basic principles of experimentation, areable to use modern physics measurement methods, and arein a position to assess the significance of results correctly.
	SSC-8	They have generally also acquired an overview knowledge in selected other natural science subjects or technical disciplines.

	SSC-9	They are able to apply their knowledge to different fields andact responsibly in their professional activity. They are moreover able to recognize new trends in their subject area and integrate the relevant methodology – if necessary, after appropriate qualification into their further work.
	SSC-10	They are able to continuously and independently extend and deepen the knowledge ac- quired in the Bachelor's degree program. They are familiar with suitable learning strategies (lifelong learning) for this; they are in particular qualified for a consecutive Master's degree program in principle.
Social Competences	SSC-11	They have gained initial experience with regard to generic qualifications (e.g. time management, study and work techniques, willingness to cooperate, capacity forteamwork, communication and presentation skills, communication and presentation techniques, programmingskills) in their degree program, and are able to develop these skills further.
	SSC-12	They are familiar with the basic elements of the relevant specialized English
	SSC-13	They are able to solve a simple scientific problem and to present their results orally (talk/presentation) and in writing (demonstrated in a Bachelor's thesis).
	SSC-14	They know the rules of good scientific practice.

The relevance of PLO and SSC of the Bachelor of Physics Study Program is presented in the matrix Figure 1.2.

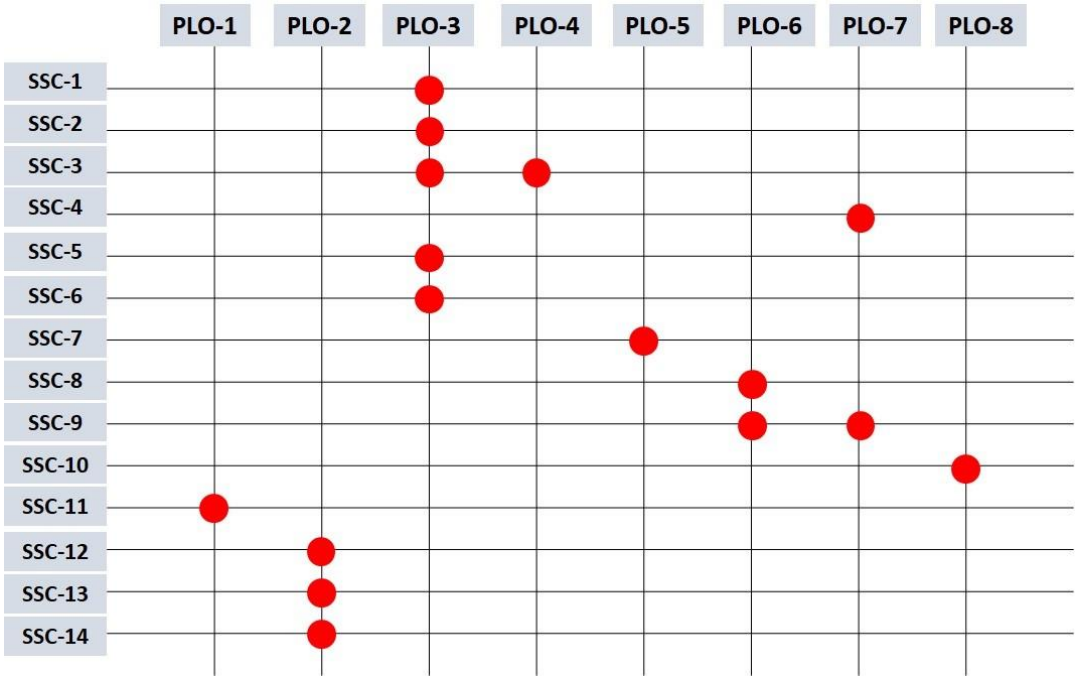

Figure 1. 2 Matrix of Relationship between Program Learning Outcomes (PLO) and Subject-Specific Criteria (SSC) of Bachelor of Physics Study Program

D. PROGRAM STRUCTURE

The Bachelor of Physics curriculum designs the vision, mission, goals, and objectives of the Bachelor of Physics Program to achieve the vision and mission of UNJ. The curriculum is created to meet expected outcomes, formulated based on input through the results of Forum Group Discussions with stakeholders, educational institutions and the government, to produce quality graduates.

The curriculum structure has been designed and aligned with the Program Learning Outcomes (PLOs). Each course is closely related to the achievement of the PLOs that have been set. In general, there are 54 courses and one final project/thesis to complete the 8 PLOs. The courses are grouped into University's Courses, Faculty's course, Study Program's Compulsory Courses, Elective Course, and Independent Learning Activities Course. University's Courses consist of 14 credits, Faculty's course consist of 3 credits, Study Program's Compulsory Courses consist of 96 credits, Elective Course consist of 11 credits, and Independent Learning Activities Course consist of 20 credits. The minimum number of credits that students must take is 144 credits or the equivalent of 216 ECTS. The curriculum of the Bachelor of Physics Program is based on the Indonesian Qualifications Framework (IQF) Level 6. In revitalizing the curriculum, we involve graduate user suggestions, discussions with all lecturers, and conduct a situation analysis of the needs of the world of work. These efforts ensure suitability and relevance to scientific developments, university and professional association regulations, suggestions from alumni and stakeholders, and job market needs.

Table 1. 3 Curriculum Structure of Bachelor of Physics Study Program

No	Types of Courses	Total (In Credits)	Total (In ECTS)
1	University's Courses	14	21
2	Faculty's course	3	4.5
3	Pedagogy's courses	0	0
4	Study Program's Compulsory Courses	96	144
5	Elective Course	11	16.5
6	Independent Learning Activities Course	20	30
Total		**144**	**216**

There are three cores of the subject matters (SM) in the curriculum as presented in Table 1.4 below

Table 1. 4 Subject Matter of Bachelor of Physics Study Program

Code	Subject Matter	Descriptions	Course
SM 1	Character building,basic scientific insight, and communication skills	Character building, Leadership, skills, mastery of basic knowledge, and communication skills.	1. Indonesian 2. Pancasila 3. General Chemistry 4. Philosophy of NaturalSciences 5. Olympism 6. English for Physics 7. Religion 8. Education Overview 9. Civic Education 10. General Biology 11. Logic and Reasoning 12. Scientific Communication
SM 2	Classical Physics (Newtonian Physics)	The basic knowledge ofphysics consists of : basic physics, mechanics, optical waves, electro-magnetism, and thermodynamics.	1. Basic Physics I 2. Basic Physics II 3. Classical Mechanics 4. Electricity and Magnetism 5. Waves 6. Thermodynamics 7. Electronics
SM 3	Mathematics, Computing, andICT	Ability to use mathematical and computational concepts in the scientific study of physics and solving physics problems.	1. Calculus I 2. Calculus II 3. Mathematical Physcis I 4. Mathematical Physics II 5. Statistics 6. Introduction to InformationTechnology 7. Big Data and Programming 8. Computer Programming 9. Computational Physics 10. C/C++ Programming Language 11. Physics Simulation

SM 4	Measurements andExperiments	Capable of working in the laboratory to comprehend physics theory and its application.	1. Basic Physics Practicum I 2. Basic Physics Practicum II 3. Electronics Practicum 4. Computer Programming Practicum 5. Modern Physics Practicum 6. Computational PhysicsPracticum 7. Digital Electronics Practicum 8. Measurement and DataAnalysis 9. Experimental Physics
SM 5	Modern Physics	Modern physics theory contains of the Fundamentals of quantum, atomic and molecular, nuclear, elementary particle, and solid-statephysics.	1. Modern Physics 2. Quantum Physics 3. Solid Sate Physics 4. Introduction to Nuclear Physics 5. Statistical Physics 6. Electromagnetic Field Theory 7. Quantum Mechanics
SM 6	Applied Physics	Apply the physics theory to the industry	1. Industrial Physics 2. Digital Electronics 3. Physics and Semiconductor Technology 4. Ultrasonic: theory andapplication 5. Microprocessors andInterfaces 6. Basic Biomedical Instrumentation 7. and Elective Course on 8. Materials, Computational, andInstrumentation Physics.
SM 7	Scientificdescr iption	Scientific and academic writing to provide scientific reports.	1. Undergraduate Pre-ThesisSeminar 2. Undergraduate Thesis 3. Research Methodology inPhysics 4. Internship

Furthermore, each course is designed to support students to achieve the PLOs. Table 1.5 presents the PLOs supported by each course in the curriculum.

Table 1. 5 Curriculum structure mapping towards PLO of Bachelor of Physics Study Program

Smt	Course code	Course Name	CP	ECTS	PLO							
					1	2	3	4	5	6	7	8
I	00051142	Indonesian	2	3	v	v						
	00051122	Pancasila Education	2	3	v							
	33250123	General Chemistry	3	4,5		v						
	30050022	Philosophy of Natural Sciences	2	3		v						
	32250671	Olympism	1	1,5	v							
	32250683	Calculus I	3	4,5			v					
	32251013	Basic Physics I	3	4,5			v					
	32251021	Basic Physics Practicum I	1	1,5	v	v			v			
	32250602	English for Physics	2	3	v	v					v	
		Total CP of Semester I	19	28,5								
II	00052033	Religion Education	2	3	v							
	00053212	Education Overview	2	3	v							
	00031062	Civic Education	2	3	v							
	32250703	Calculus II	3	4,5			v					
	34150012	General Biology	2	3		v						
	32251033	Basic Physics II	3	4,5			v					
	32251041	Basic Physics Practicum II	1	1,5	v	v			v			
	32252012	Introduction to Information Technology	2	3			V				v	
	32250112	Industrial Physics	2	3			v				v	
		Total CP of Semester II	19	28,5								
III	32254034	Mathematical Physics I	4	6			v	v				
	32253014	Electronics	4	6			v	v		v		
	32255014	Classical Mechanics	4	6			v	v				
	32253021	Electronics Practicum	1	1,5	v	v		v	v			
	32252022	Computer Programming	2	3			v	v				
	32252031	Computer Programming Practicum	1	1,5		v	v	v	v			
	32256013	Modern Physics	3	4,5			v	v				
	32256021	Modern Physics Practicum	1	1,5	v	v		v	v			
		Total CP of Semester III	20	30								
IV	32254044	Mathematical Physics II	4	6			v	v				
	32255044	Electricity and Magnetism	4	6			v	v				
	32252043	Computational Physics	3	4,5			v	v				
	32252051	Computational Physics Practicum	1	1,5		v	v	v	v			
	32250052	Digital Electronics	2	3			v			v		
	32253041	Digital Electronics Practicum	1	1,5		v			v			
	32255034	Waves	4	6			v	v				
		Total CP of Semester IV	19	28,5								
V	32254053	Statistics	2	3			v	v				
	32256073	Thermodynamics	3	4,5			v	v				

Smt	Course code	Course Name	CP	ECTS	PLO							
					1	2	3	4	5	6	7	8
	32256033	Quantum Physics	3	4,5			v	v				v
	32250014	Solid Sate Physics	4	6			v	v				v
	32250242	Measurement and Data Analysis	2	3		v	v	v	v			
	32256122	Experimental Physics	2	3		v	v	v	v			
	00053202	Logical and Scientific Reasoning	2	3	v	v						
	00053202	Big Data and Programming	2	3	v	v						
		Total CP of Semester V	20	30								
VI	3225xxxx	Internship	6	9	v	v			v		v	
		Planning and Design Activity	2	3	v	v					v	
		Reports and publications	3	4,5	v	v					v	
		Physics Workshop	3	4,5			v		v			
		Special study 1	3	4,5			v	v			v	
		Special study 2	3	4,5			v	v			v	
		Total CP of Semester VI	20	30								
VII	32256063	Introduction to Nuclear Physics	3	4,5			v	v				v
	32256043	Statistical Physics	3	4,5			v	v				v
	32250152	Research Methodology in Physics	2	3		v			v			v
	30052072	Undergraduate Pre-Thesis Seminar	2	3	v	v	v	v		v	v	
	32250752	Scientific Communication	2	3	v	v	v	v				
	3225xxxx	Elective Courses	8	12								
		Total CP of Semester VII	20	30								
VIII	30054024	Undergraduate Thesis	4	6	v	v	v	v	v	v	v	
	3225xxxx	Elective Courses	3	4,5								
		Total CP of Semester VIII	7	12.00								
		Total CP of Semester I - VIII	144	216,00								
		Elective Courses										
	32256143	Physics of Magnetic Materials	3	3			v	v		v	v	v
	32256153	Physics and Semiconductor Technology	3	3			v	v		v	v	v
	32256183	Physics of Ceramics	3	3			v	v		v	v	v
	32256213	X-Ray Diffraction	3	3			v	v		v	v	v
	32256222	Mechanical Properties of Materials	2	2			v	v		v	v	v
	32256342	Physics of Composite	2	2			v	v		v	v	v
	32256173	Physics of Metal	3	3			v	v		v	v	v
	32256253	Physics of Material	3	3			v	v		v	v	v
	32256232	Electrical Properties of Materials	2	2			v	v		v	v	v
	32256163	Physics of Polymer	3	3			v	v		v	v	v
	32258013	Capita Selecta on Computational Physics	3	3			v	v		v	v	v
	32258022	Physics Simulation	2	2			v	v		v	v	v
	32257052	C / C ++ Programming Language	2	2			v	v		v	v	v

Smt	Course code	Course Name	CP	ECTS	PLO							
					1	2	3	4	5	6	7	8
	32250763	Introduction to Machine Learning in Physics	3	3			v	v		v	v	v
	32250773	Introduction to Intelligent System Physics	3	3			v	v		v	v	v
	32250693	Digital Signal Analysis	3	3			v	v		v	v	v
	32257063	Digital Image Processing	3	3			v	v		v	v	v
	32257033	Sensor Technology	3	3			v	v	v	v	v	v
	32257022	Control System	2	2				v		v	v	v
	32257013	Microprocessors and Interfaces	3	3				v	v	v	v	v
	32250702	Ultrasonic: theory and application	2	2			v	v		v	v	v
	32250712	Basic Biomedical Instrumentation	2	2				v		v	v	v
	32250722	Industrial Electronics	2	2				v		v	v	v
	32250002	Introduction to Radiation Physics	2	2				v		v	v	v
	32250272	Materials for sensors	2	2				v		v	v	v
	32250262	Advanced Electronics	2	2			v	v		v	v	v
	32256073	Electromagnetic Field Theory	3	3			v	v				v
	32256083	Quantum Mechanics	3	3			v	v				v
	32250033	Special Study 3	3	3			v	v				v
	32250322	Laboratory Practice Assistant	2	2	v	v	v	v	v			
	32259012	Environmental Physics	2	2				v			v	
	32259032	Rock Physics	2	2			v	v			v	
	32256103	Laser and Modern Optics	3	3			v	v			v	v
	32256242	Solar Cell Technology	2	2			v	v			v	
	32259112	Condensed Matter Theory	2	2			v	v			v	v
	32250662	Entrepreneurship	2	2	v	v						
	32259072	Rock Magnetism	2	2			v	v			v	v

*) Optional elective course

E. STRUCTURE AND MODULE OF BACHELOR OF PHYSICS STUDY PROGRAM

The courses in the Bachelor of Physics study program are distributed into 8 semesters with a total of 144 credit hours (SKS). The courses consist of university courses, faculty courses, study program courses, and MBKM (Freedom of Learning). The new curriculum in accordance with Permendikbud No. 3 (2020) allows the students to carry out off-campus learning for 1 to 3 semesters. The curriculum structure of the Bachelor of Physics is presented in Figure 1.17. (note: yellow box for the study program courses, red box for the elective courses, blue box for MBKM courses, green box for the university courses, and purple box for the faculty courses).

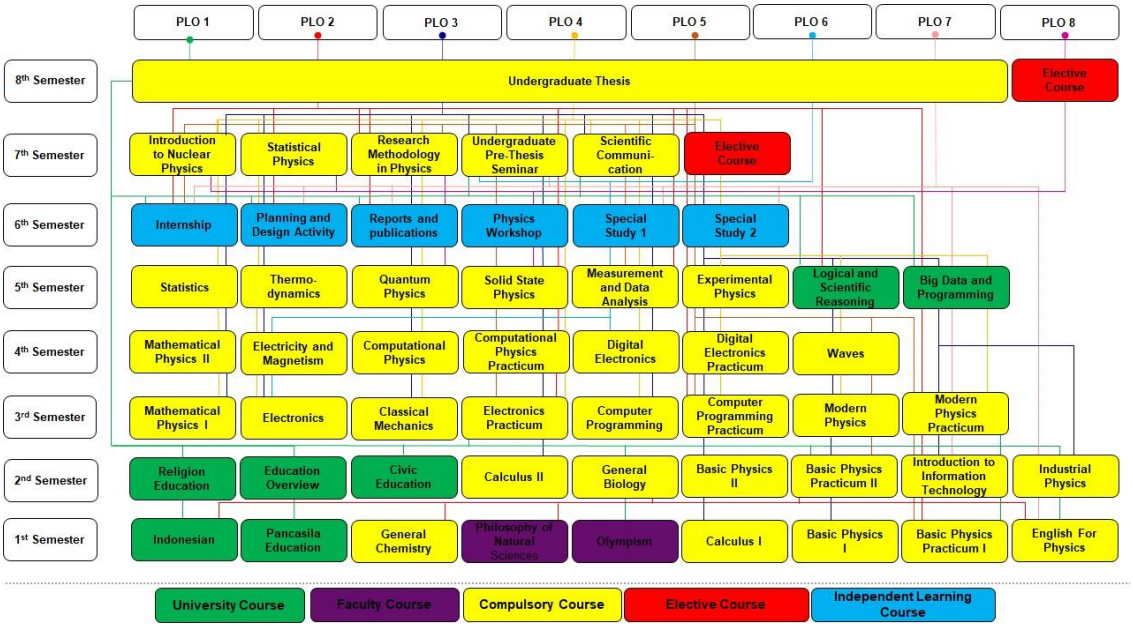

Figure 1. 3 Course mapping based on Courses and PLO in Bachelor of Physics Study Program