Curriculum Overview Master of Physics Education Study Priogramme

Faculty of Mathematics and Natural Science
Universitas Negeri Jakarta

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A. OBJECTIVES OF THE DEGREE PROGRAMME

1. The Vision and Mission of 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

Vision of 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 and Mission of Master of Physics Education Study Programme

Vision of Master of Physics Education Study Programme:

"*Becoming an excellent study program in the field of physics education which is enriched with a learning environment based on advanced information technology through collaboration at the Asian level.*"

Misson of Master of Physics Education Study Programme:

1. Developing excellent education and trained and qualified graduates that meet the needs of the local, regional, and international job market in the field of physics education.
2. Developing cutting-edge research and quality publications to support 21st-century innovation and skills in physics education.
3. Developing community service for the development of the local community in physics education.

B. PROGRAM EDUCATIONAL OBJECTIVES (PEO)

The Qualification Profile (QP)

The Qualification Profile (QP) of Master of Physics Education Study Priogramme and its specifications is presented in the table below.

Table 1 The QP of a Master of Physics Education Study Programme

No	Qualification Profile	Specifications
1	Professional Educators	Capable of proficiently design, implement, and evaluate physics learning in an advanced information technology-based learning environment.
2	Researchers	Capable of conduct research to solve recent issues in Physics Education and publish the results in national and international publications.
3	Consultant and Media Developer	Having the ability to analyze the curriculum, design learning media, and identify issues in physics education.

The Program Educational Objectives (PEO) was developed based on vision and mission in developing graduates program in Physics Education who are qualified as educator, researcher, and consultant in the field of Physics Education. The programme provides opportunities for graduates to be able to:

1. Develop yourself professionally with advanced knowledge in physics and advanced educational technology;
2. Creating innovative and tested works through the development of knowledge in the field of physics education;
3. Able to conduct quality research that is recognized nationally and internationally, and beneficial for society and scientific development.

C. PROGRAM LEARNING OUTCOMES (PLO)

The Master's Program in Physics Education aims to facilitate students in enhancing their competencies as defined and required. Based on this reason, the Program Learning Outcome (PLO) is designed in the curriculum development. The formulation of these learning outcomes is carried out in accordance with standards such as the Indonesian Qualification Framework (KKNI), accreditation bodies, and the association of professional programs. Formulation is also carried out by involving internal and external stakeholders, including academic staff, alumni, students, graduate users, and experts. The PLOs are classified into two areas of social competence and specialist competence. Learning Outcomes of Master of Physics Education Study Priogramme are presented in the flollowing Table.

Table 2 The PLO of Master of Physics Education Study Priogramme

Area	Code	Programme Learning Outcome
Social Competence	PLO 1	They have an extensive understanding the fundamental aspects of scientific theory derivation and able to assess the scope of estimates and models.
Specialist competences	PLO 2	They are conscious of their responsibility towards science and the possible consequences of their activities on the environment and community
	PLO 3	They have sound knowledge of physics and mathematics, expertise in interdisciplinary physics education and other field. Specialize in specific scope and they can access to re-cent international research.
	PLO 4	They are able to prompt professional activities in unrelated fields to the master's program, using the wisdom of physics education, scientific methods, and problem-solving strategies.
	PLO 5	They also acquired a general aptitude in selected study pro-gram, such as communication, broadcasting, work projects, and capable to work together.
	PLO 6	They can apply knowledge to diverse complex physical education problems to analyse, formulate, and solve them as comprehensively as possible in a scientific manner.
	PLO 7	They are qualified to discuss the complex physical problem and their invention in recent international research comprehensively and shown it in written form (master's thesis) and orally (presentation with open discussion).
	PLO 8	They can evaluate and denote the scientific topics that are relevant with audience needs.

The relevance between PLO and PEO of the Master of Physics Education Study Priogramme is described in the following matrix.

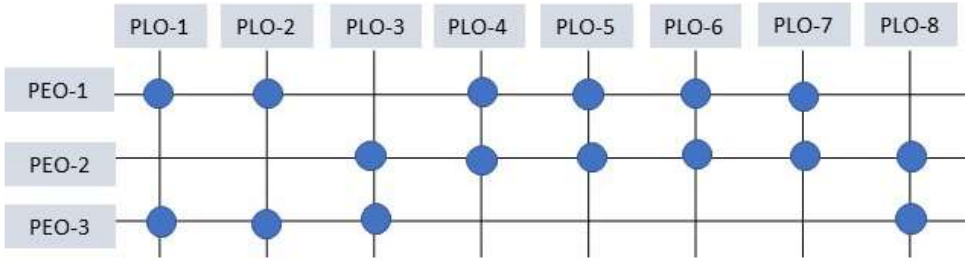

Figure 1 Matrix of Relationship between Programme Learning Outcomes (PLO) and Subject-Specific Criteria (SSC) of Master of Physics Education Study Programme

Subject-Spesific Criteria (SSC)

The Subject-Specific Criteria (SCC) developed based on the Physics Education Study Program's body of knowledge and its PLO classification. The SSC for the Physics Education Study Programme graduates are stated in the following table.

Table 3 SSC of Master of Physics Education Study Priogramme

SSC (Subject-Specific Criteria)		
Social Competence	SSC 1	They have an extensive understanding the fundamental aspects of scientific theory derivation and able to assess the scope of estimates and models.
	SSC 2	They are conscious of their responsibility towards science and the possible consequences of their activities on the environment and community
Specialist competences	SSC 3	They have sound knowledge of physics and mathematics, expertise in interdisciplinary physics education and other field. Specialize in specific scope and they can access to re-cent international research.
	SSC 4	They are able to prompt professional activities in unrelated fields to the master's program, using the wisdom of physics education, scientific methods, and problem-solving strategies.
	SSC 5	They also acquired a general aptitude in selected study pro-gram, such as communication, broadcasting, work projects, and capable to work together.
	SSC 6	They can apply knowledge to diverse complex physical education problems to analyse, formulate, and solve them as comprehensively as possible in a scientific manner.
	SSC 7	They are qualified to discuss the complex physical problem and their invention in recent international research comprehensively and shown it in written form (master's thesis) and orally (presentation with open discussion).
	SSC 8	They can evaluate and denote the scientific topics that are relevant with audience needs.

The relevance of PLO and SSC of the Master of Physics Education Study Priogramme is presented in the following matrix.

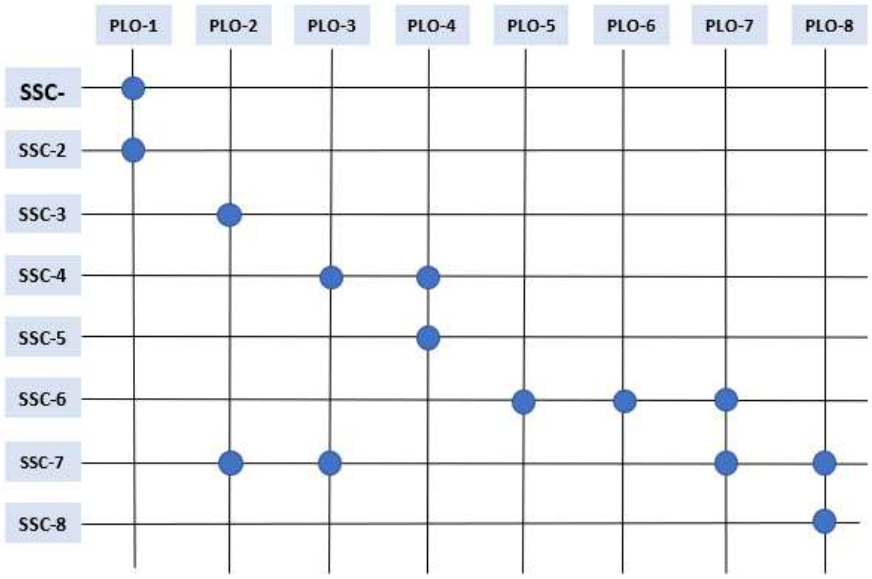

Figure 2 Matrix of relationship between Programme Learning Outcomes (PLO) and Subject-Specific Criteria (SSC) of Master of Physics Education Study Priogramme.

The learning outcomes and teaching materials implemented in the Bachelor's and Master's Degree Programs can be accessed at https://fmipa.unj.ac.id/capaian-pembelajaran-lulusan/#. The differences in the Program Learning Outcomes (PLO) between the Bachelor's and Master's Degree Programs in Education are indicated by the differences in academic vision, which the achievement and implementation of the Master's Degree Program's academic vision are higher and more advanced in terms of scientific and pedagogical fields, compared to the Bachelor's Degree Program. The learning outcomes of Bachelor's Degree Program in Education focus on mastery of the entire scientific field and its application in education through learning innovations utilizing science and technology (IPTEK). Furthermore, the learning outcomes of the Master's Degree Program in Education are achieved by advanced mastery of scientific and educational fields with advanced learning innovations enriched by utilizing science and technology (IPTEK).

The difference between the SSC in the Education and Non-Education Programs is determined by the discrepancy of academic vision, which the Non-Education Programmes focuses on the mastery of the scientific field and its application in specific research areas according to specialization. Whereas the Education Programs focuses on the fundamental scientific, pedagogical aspects, and their application in teaching materials. The formulation of the academic vision and curriculum through a process involving all academic members,

including lecturers, students, and educational staff, as well as inputs from alumni and users. The learning outcomes of each program curriculum based on student and lecturer satisfaction indexes are attached to the page: http://spm.unj.ac.id/?page_id=8690&lang=en. Based on the learning process results of the curriculum, the satisfaction index is categorized as satisfied.

D. PROGRAMME STRUCTURE

The curriculum content of the Master of Physics Education study programme contains the vision, mission, goals, and objectives of the Master of Physics Education study programme in achieving the vision and mission of the university. The curriculum is formulated based on the results of Forum Group Discussions with stakeholders, educational institutions, and the government, to produce quality graduates.

The curriculum structure is designed to align with the Outcome Learning Program (PLO). Each course is closely related to the achievement of the PLO that has been set. In general, there are 20 courses and one final project/thesis to complete the 9 predetermined PLOs. Courses are grouped into available courses, competency courses, and elective courses. Each course has a load of credits of 8, 25, and 6 consecutively. The minimum number of credits students must take is 46 credits or the equivalent of 119.6 ECTS. A number of 19 courses are distributed in 3 semesters, and a thesis project is in the fourth semester. The curriculum for the Physics Education Masters Program is based on the Indonesian Qualifications Framework (IQF) Level 8. In revitalizing the curriculum, we involved suggestions from graduate users, discussions with all lecturers, and conducted a situation analysis of the needs in the field of work. These efforts ensure conformity and relevance to scientific developments, university and professional association regulations, suggestions from alumni and stakeholders, and the labor market requirements.

Table 4 Curriculum Structure of Master of Physics Education Study Program

No	Course Group	Credits	ECTS
1	General Course	8	20.8
2	Compulsory Courses	25	65.0
3	Elective Courses	6	15.6
Total		39	101.4

There are three main subject matters (SM) in the curriculum as presented in Table 1.35 below.

Table 5 Subject Matters of the Master of Physics Education Study Program

Code	Body of Knowledge (BK)	Course Description	Course Name
SM 1	Advanced general Ability	Ability to develop critical and creative thinking, collaboration, and communication skills, problem solving, and communicate ideas about advanced physics education.	1. Advanced Mechanics 2. Advanced Electrodynamics 3. Advanced Modern Physics 4. Thesis Seminar 5. Thesis 6. Scientific Article Writing Techniques* 7. Integrated Science and Environment*

Code	Body of Knowledge (BK)	Course Description	Course Name
			8. English for Scientific Communication*
SM 2	Pedagogy Ability	Ability to develop physics learning, including planning, design, implementation, and evaluation by applying advanced information technology.	1. Physics Curriculum and Learning Design 2. Innovation in Physics Education 3. Study on Physics Education Research 4. Physics Learning Assessment 5. IT and Physics Learning Multimedia Development 6. Computer Simulation for Physics Learning* 7. Electronic Instrumentation for Physics Education* 8. Big Data in Physics Education* 9. Advanced Thermodynamics*
SM 3	Research on Education Ability	Ability to conduct research on physics education	1. Philosophy of Science 2. Educational Research Methodology 3. Educational Statistics

Furthermore, each course is designed to support students to achieve the PLOs. Table 1.36 presents the PLOs supported by each course in the curriculum.

Table 6 Curriculum structure mapping towards PLO of Master of Physics Education Study Programme

Course Code	Course Name	CP	ECTS	PLO							
				1	2	3	4	5	6	7	8
30061052	Philosophy of Science	2	5,2	v	v		v				
30061033	Educational Research Methodology	3	7,8		v					v	v
32363162	Physics Learning Curriculum and Design	2	5,2		v			v			
32363172	Physics Learning Innovation	2	5,2		v	v					v
32363202	Advanced Mechanics	2	5,2		v		v				
32363212	Advanced Electrodynamics	2	5,2		v		v				
Total CP		**13**	**33,8**								
30062013	Education Statistics	3	7,8		v					v	v

32363182	Physics Education Research Study	2	5,2		v	v			v	v	v
32363192	Physics Learning Assessment	2	5,2		V					v	v
32363113	IT and Physics Learning Multimedia Development	3	7,8		v	v		v	v		v
32363152	Advanced Modern Physics	2	5,2		v		v				
Total CP		**12**	**31,2**								
32363112	Scientific Article Writing Techniques*	2	5,2		v	v				v	v
32363063	Electronic Instrumentation for Physics Education*	3	7,8		v						v
32363232	Computer Simulation for Physics Learning*	2	5,2		v						v
32363242	Big Data in Physics Education*	2	5,2		v						v
32363252	Advanced Thermodynamics*	2	5,2		v		v				
32363142	Integrated Science and Environment*	2	5,2	v	v					v	
32363122	English for Scientific Communication*	2	5,2		v					v	
Total CP		**6**	15,6								
30084024	Thesis	6	15,6	v	v	v	v	v	v	v	v
30063032	Thesis Seminar	2	5,2		v	v	v	v	v	v	
Total CP		**8**	**20,8**								
TOTAL CREDITS		**39**	**101,4**								

*) Optional elective course

Table 7 List of Elective Courses of Master of Physics Education Study Programme

No.	Course Codes	Courses	CP	ECTS	Semester
1	32363112	Scientific Article Writing Techniques*	2	5,2	Available in every semester
2	32363063	Electronic Instrumentation for Physics Education*	3	7,8	

No.	Course Codes	Courses	CP	ECTS	Semester
3	32363232	Computer Simulation for Physics Learning*	2	5,2	
4	32363242	Big data in Physics Education*	2	5,2	
5	32363252	Advanced Thermodynamics*	2	5,2	
6	32363142	Integrated Science and Environment*	2	5,2	
7	32363122	English for Scientific Communication*	2	5,2	

E. STRUCTURE AND MODULE

The structure and courses (modules) in the Master of Physics Education study program consist of 39 kredit (SKS). The 25 credits (SKS) of compulsory courses provide the general and the basic competency for the Master of Physics Education. The elective courses offered to students consist of 2 credits (SKS) of advanced physics and 6 credits (SKS) of general competences courses. The elective courses offered are physics courses and publication-related courses. The curriculum structure of Master of Physics Education are divided into two years of study. The first year cover 25 SKS focusing on general courses and physics education courses. The second year of study focuses on physics courses, pedagogical courses, and thesis writing with a total of 14 credits (SKS). Each course contributes to the PLO ofthe Master of Physics Education study program as shown in Figure 1.22. (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).

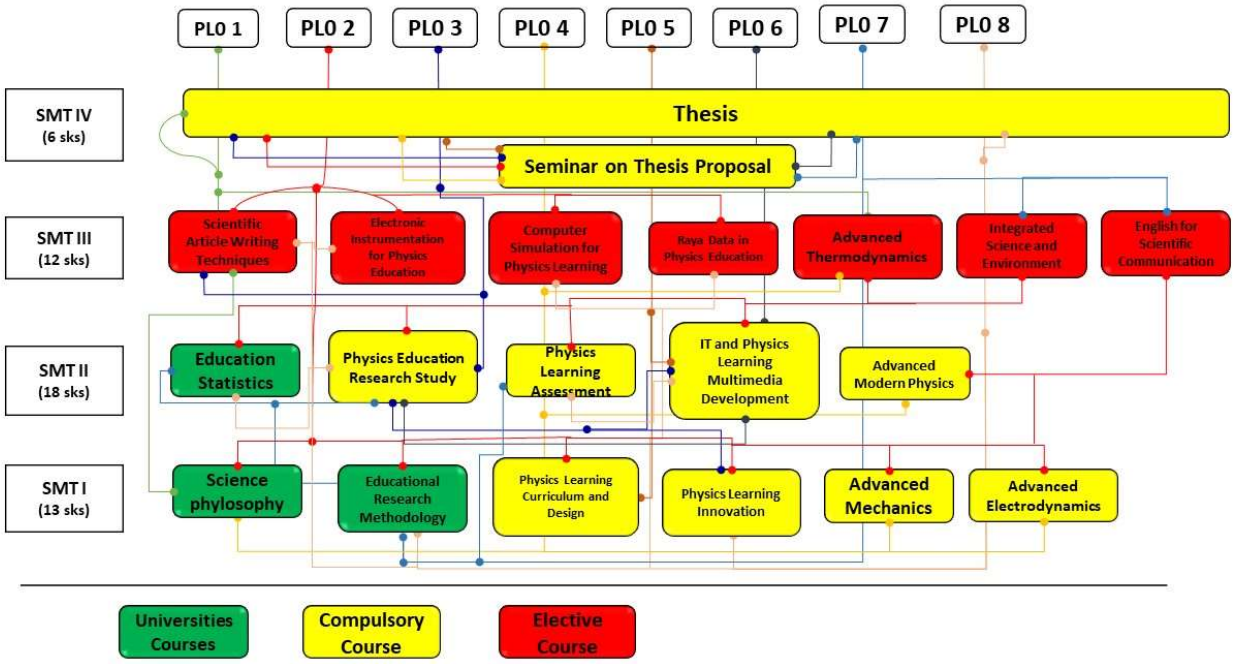

Figure 3 Course mapping based on Courses and PLO in Master of Physics Education Study Programme