CURRICULUM SUMMARY

Physics Education Study Program

Faculty of Teacher Training and Education
Mulawarman University
2021

CURRICULUM SUMMARY

PHYSICS EDUCATION STUDY PROGRAM

Task Force Team

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FACULTY OF TEACHER TRAINING AND EDUCATION
MULAWARMAN UNIVERSITY

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PREFACE

The curriculum summary is structured to provide an overview of the Physics Education Study Program's curriculum in Mulawarman University (UNMUL), Indonesia. This summary describes the graduate profile, the learning outcomes, courses, and assessment. The curriculum in higher education is required to continuously adapt to the challenges of the future and meet the need of stakeholders. To ensure graduate with expected competencies, the detailed profile of the graduate is arranged.

The curriculum also reflects the uniqueness of the study program agreed through similar programs in Indonesia and internationally. Moreover, the strength of its location and challenges in preserving the harmony of living in this environment drives UNMUL to contribute as Centre of Excellence in Tropical Studies. These fundamental ideas also influenced the curriculum. This book is divided into ten parts. It stratified through the introduction, the graduate profile, learning outcomes, structures of the courses, and the assessment of the curriculum.

We would like to express our gratitude to all the contributors that support the process. As a program in higher education, the curriculum is the base of academic services. The continuous communication and suggestion from stakeholder and alumni are always welcome to improve the curriculum for the future.

Samarinda, May 15th 2021

Task Force Team

1. Introduction to Mulawarman University

Mulawarman University or abbreviated UNMUL, is a national university located in Samarinda city, East Borneo province, Indonesia. The university was established on September 27th 1962. At the beginning of its establishment, this university has four faculties, then based on the Decree of President of Republic of Indonesia no 66 on September 7th 1982, became five faculties include Faculty of Teacher Training and Education. Since 2017, UNMUL gained higher accreditation status from "good" to "excellence" from the National Board of Accreditation with the decision letter 1466/SK/BAN-PT/Akred/PT/V/2017. Until now, UNMUL is the university on Borneo island with the most students with 36.342 students.

UNMUL is located on Borneo island that well-known for the most expansive tropical rainforest area in Indonesia. The strength of its location and challenges in preserving the harmony of living in this environment drives UNMUL to contribute as Centre of Excellence in Tropical Studies. This central idea clarifies UNMUL's vision and mission:

Vision Being a University with International Standard, participating in the national development through Education, Research and Community Services, which is based on the Natural Resources particularly in the Humid Tropical Rain Forest and its environment

Mission

1. To produce qualified human resources, personality, and professional through the organization of higher education with international standards.
2. To produce high quality and efficient research by promoting the principles of sustainability
3. To hold accountable management and independent university in accordance with the national standard.

For supporting its educational service, UNMUL has one main campus and three supporting campuses located in Samarinda city: Gunung Kelua Campus, Banggeris Campus, Pahlawan Campus, and Flores Campus. In 2020, UNMUL has grown with the new faculties and study programs, which are 96 study programs divided into 14 faculties and 15 graduates' program (https://unmul.ac.id/page/program-studi-1510735157.html). Faculty of Education and Teacher Training has the highest number of students with 8.106 students or around 22% of all the faculties. This Faculty is the most supplier of education staff in 9.694 schools around East Borneo province.

Gunung Kelua Campus is located in Gunung Kelua district in Samarinda city with an area ± 70 hectares. Most of the facilities located on this campus are the administration facility,

faculties (including the Faculty of Teacher Training and Education). The map of Gunung Kelua Campus is presented in Figure 1. There is four access to this campus: Yamin Gate, Gelatik Gate, Perjuangan Gate, and Ruhui Rahayu Gate.

Figure 1. The Map of UNMUL Main Campus

In line with the university vision, education field specialty, and the needs of stakeholders, the Faculty of Teacher Training and Education (Figure 2) arrange its vision and mission:

Vision Being a Faculty with International Standard in the field of education which is based on the Natural Resources particularly in the Tropical Rain Forest and its environment

Mission

1. Organizing research-based professional education and producing innovative educational products that contribute to the improvement of quality and public welfare at the local, regional and international levels.
2. Developing innovative research and applied research focusing on innovation and learning development to increase the quantity and quality of national and international scientific publications and Intellectual Property Rights (IPR).
3. Organizing cooperation in the education, research, and community service at the regional, national, and international levels.
4. Organizing student activities to foster students' independence, boost creativity

and entrepreneurship as well as improve talents.

5. Strengthening institutional capacity to provide excellent service and cooperation to produce independent and superior educators with integrity.

Figure 2. Faculty of Teacher Training and Education

Among sixteen study programs in this Faculty, Physics Education Program was established in 1993 with the decree DIKTI RI No. 288/DIKTI/kep/1993. From 2018, this program had achieved the predicate of excellence from National Accreditation Board with decree No. 395/SK/BAN-PT/Akred/S/II/2018. After curriculum design for four years program and the graduate degree is Bachelor of Education (B.Ed). To achieve the intended learning outcomes, the educational system in this program follows the concept of outcome-based education. To achieve the vision of the university and Faculty, this program vision and mission are:

Vision Being a Study Program with International Standard in the field of physics education which is based on the Natural Resources particularly in the Tropical Rain Forest and its environment

Mission

1. Acquiring the ability to apply knowledge and skills in teaching and learning practices which include planning, implementing, and evaluating.
2. Obtaining the skills to solve problems and decision making using scientific methods in the field of physics education.
3. Obtaining the ability of long life learning independently

4. Gaining the ability to communicate both oral and writing as well as work independently and in team.
5. Have qualifications that meet the needs of the job and have an entrepreneurial spirit.
6. Understanding professional responsibility and ethics.

The program is designed to produce the alumni with four groups of competencies: attitude, knowledge, general skills, and specialty skills that follow the Regulation of Ministry of Education and Culture, Republic of Indonesia number 3 in 2020 about national standards of higher education. For supporting the academic services, this program has various facilities from classes and laboratories. For the laboratories, it is divided as a science laboratory and an education laboratory, with the detail follows:

1) Science Laboratory

The science laboratory consists of two types which are the basic laboratory and advance laboratory. The basic science laboratories are Basic Physics Laboratory (Figure 3) and Science Learning Centre (Figure 4). Moreover, the advanced science laboratory is Integrated Laboratory (Figure 5). This laboratory facilitates advanced research in the scope of applied science and environmental research. Science Learning Centre and Integrated Laboratory built through Islamic Development Bank (IsDB) Grant in 2016 (http://piu-idb.unmul.ac.id/hard).

Gambar 3. Group Activity in Basic Science Laboratory

Figure 4. *Science Learning Centre*

Figure 5. *Integrated Laboratory*

2) Education Laboratory

The education laboratory is Microteaching Laboratory (Figure 6). It is a facility that supports pedagogy skills. Through the activities in this laboratory, the pre-service physics teacher has opportunities to train and improve their teaching skills with their peers support as students. The experience of planning, implementing, and evaluating Physics Subject train their pedagogical content knowledge into real activity. After joining these activities, pre-service teachers are well prepared for teaching at the high school level.

Figure 6. Microteaching Laboratory

To develop pre-service physics teacher, the students are also facilitated to teach in high school for one semester. To support this activity, collaboration with schools around East Borneo is developed (Figure 7). Moreover, collaboration with the international teacher association also maintained. The SEA Teacher Program facilitates the exchange program among East Asian countries (https://seateacher.seameo.org/). In Figure 8, one of the students in the Physics Education Program had an opportunity to teach in Thailand.

Figure 7. Teaching Practice Activities in Schools

Gambar 8. Sea Teacher Program in Thailand

2. Graduate Profile of Physics Education Study Program

The graduate profile could be seen in Table 1.

Table 1. Graduate Profile

Profile	Description
Bachelor of Physics Education	1. Acquiring the ability to apply knowledge and skills in teaching and learning practices which include planning, implementing, and evaluating. 2. Obtaining the skills to solve problems and decision making using scientific methods in the field of physics education. 3. Obtaining the ability of long life learning independently 4. Gaining the ability to communicate both oral and writing as well as work independently and in team. 5. Have qualifications that meet the needs of the job and have an entrepreneurial spirit. 6. Understanding professional responsibility and ethics.

The profile of graduates of the Physics Education Study Program is expected to be able to enter the professional field in accordance with expertise in the field of physics education.

Thus, graduates can pursue, contribute knowledge, skills, and expertise according to their field of expertise, or create new jobs relevant to their expertise. The graduate profile is essential to identify the job opportunities for the graduates and self-improvement after graduation.

The tracer study concluded that the graduates are working as physics teachers in junior high school and senior high school in Indonesia, lecturer in universities, trainer, tutor in informal education institutions, and continuing their master's degree. Furthermore, some graduates also work as employees in companies, civil servants, and become entrepreneurs. Based on the variation of employment that they have; the Physics Education Program always try to develop Technological Pedagogical Content Knowledge (TPACK) in the curriculum that became the strong point of this program.

3. Program Learning Outcomes

The Program Learning Outcomes (PLO) is arranged based on guidance in the Regulation of the Ministry of Education and Culture Republic of Indonesia number 8, 2012. PLO is the set of abilities that are obtained through the internalization of knowledge, attitude, skills, competencies, and accumulated work experiences. The first aspect of PLO is knowledge. It is the set of specific knowledge in the field of study in a program that is suitable with the program's level (for the undergraduate program, it is level VI according to the national regulation). Second, attitude; is a set of attitudes, behavior, character, and personality that should be possessed by a person that graduates from a higher education institution. Those attitudes also the positive character that became the uniqueness of Indonesian. Third, general skills; is a set of skills that will help graduator in their future employment. The last is specific skills which describe the skills that pre-service physics teacher should achieve.

The PLO for Physics Education Program specifically have been derived from former regulation, the Regulation of the Ministry of Education and Culture Republic of Indonesia no 3, 2020, and the Physics Education Association Agreement both national and international. The PLO of Physics Education Study Program can be seen in the table 2:

Table 2. The PLO of Physics Education Study Program

Aspect	Code	Description
Knowledge	K-01	Understanding the basic concepts, principles, theories and branches of classical physics and familiar with the modern physics
	K-02	Applying technology, pedagogy, content, knowledge in the field of physics education
	K-03	Applying the physics concepts in problem solving
	K-04	Understanding the connection among science-technology-

Aspect	Code	Description
		engineering-mathematics and others related subjects
General Skills	GS-01	Extending the knowledge acquired in the Bachelor's degree programme
	GS-02	Having communication skills in Indonesia language and familiar with English
	GS-03	Considering the scientific ethics and professional principle as well as skills of responsible and teamwork
Specifics Skills	SS-01	Having the skills to plan, implement and evaluate physics teaching and learning
	SS-02	Having the skills to plan, carry out and report the result of physics experiment
	SS-03	Having the skills to design learning media for physics learning and physics experiment

The PLO that is arranged based on national regulations is also in line with international association standards such as Subject-Specific Criteria (SSC) in Physics developed by the international accreditation board Accreditation Agency for Study Programmes in Engineering, Informatics, Natural Sciences and Mathematics (ASIIN). The relevance of PLO and SSC ASIIN could be observed in Table 3. Based on the table, all SSC ASIIN points are represented in PLO, especially in knowledge and skills aspects. Meanwhile, some PLO points are not represented in SSC ASIIN because those points are related to the educational aspects and the uniqueness of Indonesian characters.

Table 3. The relevance of ASIIN *Subject-Specific Criteria* 13 with PLO

Aspect	ASIIN SSC	Code	PLO
Fundamental Physics Concept	They have sound knowledge of classical physics and are familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle, and solid-state physics. (TC-01)	K-01	Understanding the basic concepts, principles, theories and branches of classical physics and familiar with the modern physics
	They are familiar with important mathematical methods used in physics and can use these to solve physics problems. (TC-02)	K-03	Applying the physics concepts in problem solving
	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. (TC-03)	K-01	Understanding the basic concepts, principles, theories and branches of classical physics and familiar with the modern physics
	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. (TC-04)	K-03	Applying the physics concepts in problem solving
	They have a basic capacity to comprehend physics problems. This will in general however not yet facilitate a deeper understanding of current research areas. (TC-05)	K-03	Applying the physics concepts in problem solving
	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. (TC-06)	K-04	Understanding the connection among science-technology-engineering-mathematics and others related subjects
	They have generally also acquired an overview knowledge in selected other natural science subjects or technical disciplines. (TC-08)	K-04	Understanding the connection among science-technology-engineering-mathematics and others related subjects
Practical Skills	They are familiar with basic principles of experimentation, are able to use modern physics measurement methods, and are in a position to assess the significance of results correctly. (TC-07)	SS-02	Having the skills to plan, carry out and report the result of physics experiment
	They know the rules of good scientific practice. (TC-14)	SS-02	Having the skills to plan, carry out and report the result of physics experiment
Interpersonal Skills	They are able to apply their knowledge to different fields and act responsibly in their professional activity. They are moreover able to recognise new trends in their subject area and	K-02	Applying technology, pedagogy, content, knowledge in the field of physics education

Aspect	ASIIN SSC	Code	PLO
	integrate the relevant methodology – if necessary after appropriate qualification – into their further work. (TC-09)	SS-01 SS-03	Having the skills to plan, implement and evaluate physics teaching and learning Having the skills to design learning media for physics learning and physics experiment
	They are able to continuously and independently extend and deepen the knowledge acquired in the Bachelor's degree programme. They are familiar with suitable learning strategies (lifelong learning) for this; they are in particular qualified for a consecutive Master's degree programme in principle. (TC-10)	GS-01	Extending the knowledge acquired in the bachelor's degree program
	They have gained initial experience with regard to generic qualifications (e.g. time management, study and work techniques, willingness to cooperate, capacity for teamwork, communication and presentation skills,, communication and presentation techniques,programming skills) in their degree programme, and are able to develop these skills further. (TC-11)	GS-03	Considering the scientific ethics and professional principle as well as skills of responsible and teamwork
	They are familiar with the basic elements of the relevant specialised English. (TC-12)	GS-02	Having communication skills in Indonesia language and familiar with English
	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). (TC-13)	GS-02	Having communication skills in Indonesia language and familiar with English

4. Distribution of Subjects

The course distribution consists of 8% of university courses that emphasize general subjects, 8% of compulsory courses at the Faculty of Teacher Training and Educational Sciences and 84% of study program subjects with the following details:

a. University compulsory subject group (12 credits)
b. Faculty compulsory subject group (12 credits)
c. Study program group (113 credits)
d. Elective subject group (22 credits)

In eight semesters, students expected to complete all the courses offered. The distribution of courses can be observed in Table 4.

Subjects are formed based on Program Learning Outcomes (PLO) which charged to the courses in our program. Based on Regulation of Ministry of Research, Technology and Higher Education No. 44 in 2015:

a. Student learning load as referred to in Article 17 is stated in the amount of semester credit units (SKS).
b. One SKS is equivalent to 170 (one hundred and seventy) minutes of learning activities per week per semester (equivalent to 2.83 hours, or 3 hours rounded)
c. Each course loads at least 1 (one) SKS.
d. Semester is a unit of time for practical learning activities for 16 (sixteen) weeks. The definition of SKS is still related to the unit of time.
e. One SKS for courses conducted with lectures (lectures) means three kinds of activities, namely: face-to-face activities for 50 minutes/week/semester, structured learning activities for 60 minutes/week/semester, and independent study activities for 60 minutes, all in units per week, per semester.
f. The estimated amount of credits for a course or learning experience planned to be carried out by simultaneously analyzing the following variables: (a) the level of ability/competence to achieved, (b) the extent and depth of the study material studied, (c) the learning strategies to be applied, (d) the position (location of the semester) a learning activity carried out, and (e) a comparison of the overall study load in one semester, the definition of SKS, the time unit required by students to achieve specific learning outcomes through a form of learning and certain study materials.
g. One SKS seminar or other similar learning forms, namely: face-to-face activities for 100 minutes/week/semester and self-study 70 minutes/week/semester.

h. Practicum, field practice, research, community service or other forms of learning one credit equivalent to 170 minutes/week/semester.

Table 4. Distribution of Courses

No	Course Group	Course Name	Semester	Credit	PLO	SSC ASIIN
1	University Courses	Civic Education	2	2	K-04	TC-06, TC-08
2		Basic Socio-Cultural Sciences	2	2	K-04	TC-06, TC-08
3		Religious Education	1	3	K-04, GS-03	TC-06, TC-08 TC-11
4		Pancasila Education	1	2	K-04, GS-03	TC-06, TC-08 TC-11
5		Indonesian Language	1	2	GS-02	TC-12, TC-13
6		Community Service Program	7	3	GS-03	TC-11
7	Faculty Courses	Introduction to Educational Sciences	1	2	K-02	TC-09
8		Learning and Instruction	3	2	K-02	TC-09
9		Learner Development	2	2	K-02	TC-09
10		Educational Profession	4	3	K-02, GS-03	TC-09 TC-11
11		Field Orientation	7	3	K-02, GS-03	TC-09 TC-11
12	Cross-Study Courses	General Biology	1	3	K-04	TC-06, TC-08
13		Basic Chemistry	1	3	K-04	TC-06, TC-08
14		Basic Mathematic	1	3	K-04	TC-06, TC-08
15	Study Program Courses (Physics)	Basic Physics 1	1	2	K-01	TC-01, TC-03
16		Basic Physics Practicum 1	1	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
17		Basic Physics 2	2	2	K-01	TC-01, TC-03
18		Basic Physics Practicum 2	2	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
19		Mathematical Physics 1	2	3	K-03	TC-02, TC-04, TC-05
20		Mechanics	2	2	K-01	TC-01, TC-03
21		Mechanics Practicum	2	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
22		History of Physics	2	2	K-01	TC-01, TC-03
23		Basic Physics 3	3	2	K-01	TC-01, TC-03
24		Basic Physics Practicum 3	3	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
25		Environmental Physics	3	2	K-03	TC-02, TC-04, TC-05
26		Integrated Science	3	2	K-04	TC-06, TC-08
27		Mathematical Physics 2	3	3	K-03	TC-02, TC-04, TC-05

No	Course Group	Course Name	Semester	Credit	PLO	SSC ASIIN
28		Thermodynamics	3	3	K-01	TC-01, TC-03
29		Space Earth	4	3	K-04	TC-06, TC-08
30		Electronics	4	2	K-01	TC-01, TC-03
31		Electronics Practicum	4	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
32		High School Physics	4	2	K-01	TC-01, TC-03
33		Wave Vibration	4	2	K-01	TC-01, TC-03
34		Wave Vibration Practicum	4	1	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
35		Magnetic and Electricity	4	3	K-01	TC-01, TC-03
36		Mathematical Physics 3	4	2	K-03	TC-02, TC-04, TC-05
37		Modern Physics	5	3	K-01	TC-01, TC-03
38		Optics	5	3	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
39		Laboratory Research	5	2	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
40		Astronomy	6	2	K-04	TC-06, TC-08
41		Digital Electronics	6	2	K-01	TC-01, TC-03
42		Experimental Physics	6	2	K-03, SS-02	TC-02, TC-04, TC-05 TC-07, TC-14
43		Introduction to Core Physics	6	3	K-01, GS-01	TC-01, TC-03 TC-10
44		Introduction to Quantum Physics	6	3	K-01, GS-01	TC-01, TC-03 TC-10
45		Introduction to Solid Physics	7	3	K-01, GS-01	TC-01, TC-03 TC-10
46	Study Program Courses (Learning)	Computer Application	2	2	K-02, SS-03	TC-09
47		English	2	2	GS-02	TC-12, TC-13
48		Laboratory Management	3	3	K-01, SS-02	TC-01, TC-03 TC-07, TC-14
49		Study the Junior High School Curriculum	3	2	K-02	TC-09
50		Study the High School Curriculum	4	2	K-02	TC-09
51		Evaluation and Assessment	5	3	K-02, SS-01	TC-09
52		Entrepreneurship	5	2	K-04	TC-06, TC-08
53		Learning Media	5	2	K-02, SS-03	TC-09

No	Course Group	Course Name	Semester	Credit	PLO	SSC ASIIN
54		Physics Learning 1	5	3	K-02, SS-01	TC-09
55		Physics Learning 2	6	3	K-02, SS-01	TC-09
56		Statistics 1	5	2	K-04	TC-06, TC-08
57		Tropical Forest Environmental Sciences	6	2	K-04	TC-06, TC-08
58		Research Methodology 1	6	2	K-04, GS-01	TC-06, TC-08 TC-10
59		Microteaching	6	2	K-02, SS-01	TC-09
60		Statistics 2	6	2	K-04	TC-06, TC-08
61		Research Methodology 2	7	2	K-04, GS-01	TC-06, TC-08 TC-10
62		Thesis	8	6	K-02, GS,-01, GS-03, SS-01, SS-03	TC-09, TC-10, TC-11
63	Elective courses	Medical Physics	5	2	K-01	TC-01, TC-03
64		English For Learning Physics	5	2	GS-02	TC-12, TC-13
65		Material Physics	6	2	K-01	TC-01, TC-03
66		Photography	7	2	K-04	TC-06, TC-08
67		Education Management	7	2	K-02	TC-09
68		IT Applications in Learning Physics	8	2	K-02, SS-03	TC-09 TC-07, TC-14
69		Teacher Professional Ethics	8	2	GS-03	TC-11
70		Chemistry and Management of Hazardous Material and Wates	8	2	K-01, SS-02	TC-01, TC-03 TC-07, TC-14

5. Prospective Students Admission

Admission of new students in the Physics Education Study Program follows the national and independent admission pathway implemented by UNMUL https://unmul.ac.id/page/pendaftaran-sarjana-1486971670.html. Alumni from the Science Department at high school and equivalent can apply through the registration route consisting of:

a. National Selection for State Universities uses the report card results as a basis for selection considerations.
b. Computer-Based Written Examination and State Higher Education Entrance Joint Selection are simultaneous selections with other state universities using the result results as selection considerations.
c. Independent Selection to Enter State Universities which is an independent selection by UNMUL.
d. Affirmation program is an admission route based on remarkable achievements or cooperation with cities/provinces/regions with specific considerations.

Every year, the program accepts 50 new students through these four selection paths. This number considers the ratio of lecturers to students and the facilities available to support the lecture process.

6. Graduates and Job Opportunities

The curriculum in the Physics Education Study Program prepares by considering the needs of graduate users in physics education for both junior and senior high schools. The learning experience in the Physics Education Study Program is also designed by considering graduates' readiness to pursue further education.

The need for physics teachers continues to increase following the increase in the population of high schools. Graduates of the Physics Education Study Program needed in the community. It can reflect graduates' increased absorption rate in work with short waiting times of less than six months. Efforts to continue to communicate with alumni are carried out regularly through a tracer study questionnaire filled out online via the https://perkasa.unmul.ac.id/perkasa/pages/tracer-study/read.

Through a lecture process that pays close attention to the application of physics education in the world of work, students have experience taking theoretical courses in physics and learning, practical lectures in physics and teaching experiences that equip graduates to adapt

to the world of work. The experience of working together and solving problems in classes also prepares graduates to contribute to society.

7. Lecturing Method

The Learning Process Standards in the Physics Education Study Program include the characteristics, planning, implementation, and learning load of students. The standards are under the government's National Higher Education Standards as stipulated in the Indonesian Minister of Education and Culture Regulation No. 3 of 2020. The characteristics of the lecture process in the Physics Education Study Program are interactive which prioritizes a two-way interaction process between students and lecturers; holistic which encourages the formation of a comprehensive and broad mindset by internalizing local and national excellence and wisdom, this is reflected in the courses that integrated with the UNMUL Principal Scientific Pattern (PIP); integrative with interdisciplinary and multidisciplinary approach programs that reflected in cross-study programs and even faculty lectures; scientific prioritizes a scientific approach; contextual adapted to the demands of the ability to solve problems in their realm of expertise; thematic related to fundamental issues through a transdisciplinary approach; practical by emphasizing the internalization of the material correctly and adequately in an optimum time; collaborative; and student-centered.

Before the learning process carried out, the module description prepared for each course. The learning process carried out following the description which has been arranged systematically and structured, using learning methods such as group discussions, simulations, case studies, collaborative learning, cooperative learning, project-based learning, problem-based learning, or other learning methods, which can effectively facilitate fulfilment of graduate learning outcomes.

a. Lecture Schedule and Lecture Rooms

Lectures are conducted by combining physics and learning physics theories through face-to-face lecture, physics practicum, physics learning practicum (Microteaching), and internship experiences in schools. Lecture activities supported by the UNMUL Academic Information System (SIA) allow taking credits per semester and processing grades through this system. SIA can access via the https://sia.unmul.ac.id/login. In addition to face-to-face learning, online learning also carried out supported by the Mulawarman Online Learning System (MOLS), which can be observed on the https://mols.unmul.ac.id/ page. An example of the MOLS of a lecturer can be seen in Figure 9. Lecturers and students can interact

through this system, and the collection of assignments can also be facilitated more transparently.

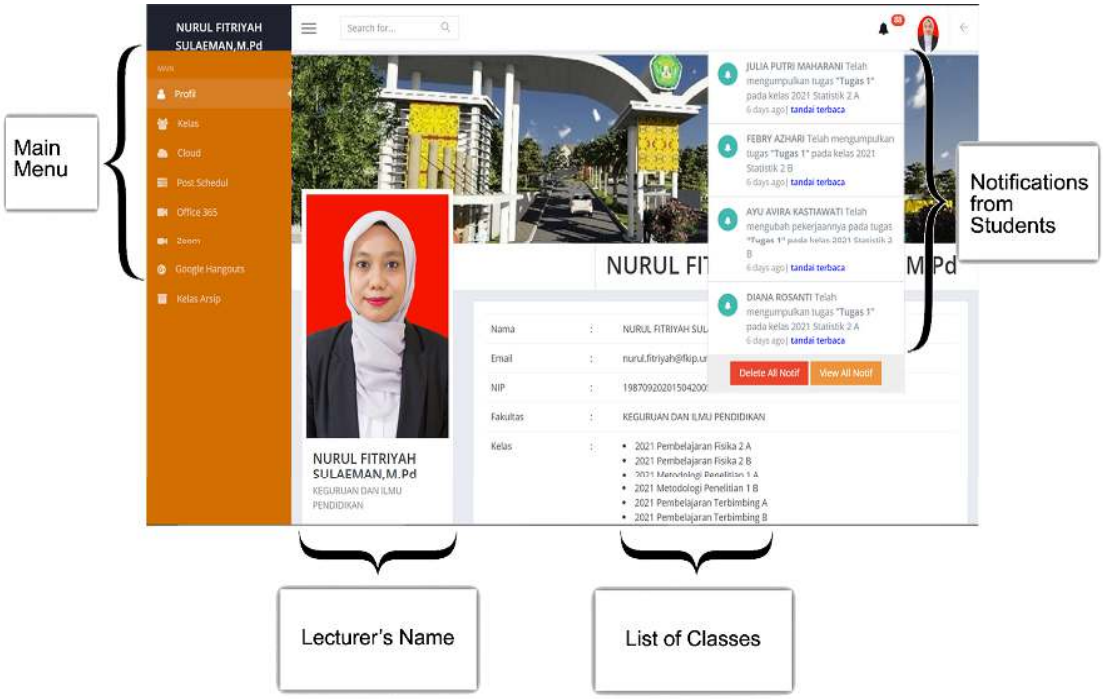

Figure 9. Example of MOLS Display

The Physics Education Study Program's lecture schedule compiled and determined based on the UNMUL Academic Calendar, which set every academic year. The Faculty carries out the compilation of this lecture schedule by involving all Study Programs in a meeting held at least one month before the odd semester lecture of the current academic year (August). The Study Program then prepares a class schedule for each Study Program by involving all lecturers who teach the study program's courses. Class schedules for compulsory university courses and required faculty courses from each Study Program reported to the Faculty. Furthermore, synchronization will be carried out and coordinated with MKWF and MKWU managers to obtain definite names of lecturers.

The lecture room's uses four rooms that used together with the teaching and education faculties. For general lectures, the program utilizes a meeting room/hall belong to the Faculty or University. The study program also used the Physics Education laboratory facilities, with a schedule set by the Study Program and proposed to the Faculty, so its use can be optimal and well scheduled.

b. Face-to-face Lecture Activities

Face-to-face lectures held for 16 weeks, including Middle and End Semester Examinations (UTS and UAS). Students and lecturers must sign a list of attendees at each face-to-face lecture held every week. Lecturers are not allowed to move the definitive lecture schedule from the subject being taught to another time, room or place, without the program coordinator's permission. The transfer of face-to-face class schedules must also be agreed upon by all students so that no student is disadvantaged or unable to attend the lecture due to the class schedule change.

The length of the face-to-face lecture conducted by the lecturer is following the Faculty's provisions based on the number of credits/courses: 1 SKS = 50 minutes; 2 credits = 100 minutes; and three credits = 150 minutes. Lecturers are required to make a Study Contract with students in the first week of class to carry out face-to-face lectures in an orderly and conducive manner.

c. Integrated Learning with PIP UNMUL

To implement the transformation and integration of PIP UNMUL into learning by the established strategy model, namely the Separated Model, and the Segmented Model. Facts, examples, problems, or cases and activities and assignments given to Physics Education program students, must be relevant or related to the field of expertise of the Study Program so that learning becomes meaningful and contextual. Facts, examples, problems, cases or assignments given are also related to PIP UNMUL, so that they can build critical awareness and collective awareness to PIP UNMUL and their descriptions and have a positive impact on understanding, thinking skills, and acting skills of students in long-term.

The integration of PIP UNMUL into courses is carried out strategically and comprehensively. It is appropriately integrated for subjects with its course learning outcomes. The awareness to tropical environment is implemented through the module descriptions and student's handbook. There is a course that specifically design to connect the physics and tropical environmental issues in the courses, which is the Environmental Physics course. While in other courses, the tropical environmental context is added to the learning materials.

d. Learning Based on Student-centered Learning (SCL)

The learning approach used is Student-centered Learning (SCL). In learning with SCL, conventional learning methods such as lectures, question and answer, assignments, practice questions, or routine discussions can still be used. However, lecturers are expected to be able to use a constructive, cooperative, collaborative, contextual, or ICT-based learning model and

multimedia. The goal is that learning becomes more fun, challenging, relevant, and meaningful and can develop students' character or attitudes.

In learning with SCL, various learning activities are integrated to develop student's soft skills from the start and on an ongoing basis. All lecturers in the physics education study program are encouraged to use SCL as much as possible, which can develop the soft skills of the lecturers according to the courses being taught. The program coordinator examines the implementation of SCL in the module descriptions and the lecture process conducted by lecturers. Moreover, the program coordinator will periodically improve the competence of lecturers in learning with SCL and soft skills.

e. Practicum Activities

Practical activities can be in the form of part of a particular subject or a special practicum course. There are subjects with a composition (2-1), (1-2), or (0-3), meaning two credits for face to face + 1 credit for practicum, or one credit for face to face + 2 credits for practicum, or 3 credits for practicum. The arrangement of credits for practicum has been determined in the course structure in the Physics Education Study Program. Length of time for practicum 1 credit = 170 minutes, 2 credits = 340 minutes, or 3 credits = 510 minutes per week.

The lecture model with practicum can be in the form of (a) face-to-face lectures are completed first, then continue with practicum, or (b) are carried out alternately between face-to-face lectures and practicum each week, or (c) face-to-face lectures are held in class during 1-2 hours then move to the practicum room for 1 or 2 x 170 minutes. This kind of practicum model will affect the preparation of face-to-face lecture schedules and practicum schedules.

To facilitate the implementation of practicum, lecturers who are teaching practical courses are required to prepare practicum guidelines and activities that students will carry out since it is related to the procurement of the necessary materials and tools. Practicum can be carried out in laboratories, workshops, or other rooms/places prepared for practicum, either inside the Faculty, Universities, or off-campus. The Physics Education Study Program has a physics education laboratory and laboratory equipment that can be used for practicum. Practicum facilities at the university level or the Mathematics and Natural Sciences Faculty are provided to support them. The study program also collaborates with the educational institutions around East Borneo so that students can take advantage of the practicum facilities from our partners.

f. Final Project (Thesis)

The thesis is the final assignment of undergraduate students due to their research on a problem or topic following the Study Program guided by two supervisors and tested in an

open session in the Study Program. Thesis writing is a vehicle for training and developing a culture of thinking and acting scientifically and the students' high moral integrity.

In preparing the thesis, it is ho ped that the Physics Education Study Program and Supervisors will direct their research to include local settings according to the PIP-UNMUL description to provide colours and nuances of local excellence from UNMUL in the thesis made by students. Discussion of student research results discusses the results of analysis and research findings. It discusses the possibility of implementing research results or findings in East Kalimantan or District / City in the physical aspect or socio-cultural and economic environment.

Faculties and Study Programs compile Thesis Guidelines and Thesis Consultation Books so that students can complete their thesis in the right time and process. The publication of articles from the final project research is carried out through journals managed by the study program, namely the Journal of Physics Education Literacy (JLPF) which can be accessed via the https://jurnal.fkip.unmul.ac.id/index.php/JLPF and other national journals in a linkage of similar study programs.

8. Support Structure

Minister of Research and Higher Education Regulation number 44, 2014 concerning Management and Implementation of Education, Statutes, and Strategic Plans of UNMUL are guidelines in preparing the organizational structure of UNMUL, which is illustrated in Figure 10:

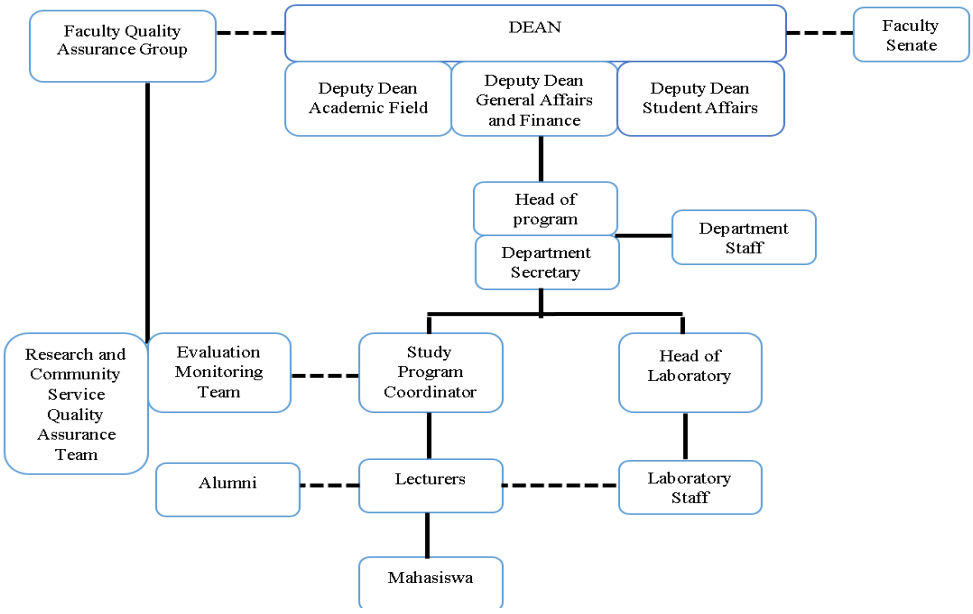

Figure 10. Organizational Structure

Each unit's duties/functions are based on the organizational structure is described in table 5 below:

Table 5. Organizational Structure

Position	Tasks/Functions
Dean **Prof. Dr. Muh. Amir Masruhim, M.Kes**	The Dean as a faculty leader has duties such as leading, planning, coordinating, implementing, and evaluating the implementation of educational and instructional activities, research, community service, coaching lecturers, technical and administrative staff, and student coaching at the Faculty of Teacher Training and Education. The dean pioneers, fosters, enhances, and develops external cooperation. The dean also maintains and develops a conducive academic climate so that academic activities can be held with good results. The dean supervises the Faculty Strategic Plan and Work Program as well as Expenditure Budget Plan with senate approval following the mechanisms and provisions of UNMUL; The dean also provides periodic reports to the UNMUL Rector on the implementation of his duties.
Vice Dean: **1. Dr Zulkarnaen, M.Si.** **2. Dr Sunardi, S.S., M Hum.** **3. Dr. H. Yudo Dwiyono, S.Pd., M.Si.**	The Faculty of Teacher Training and Education has three vice deans, consisting of: 1) The Deputy Dean for Academic Affairs, who has the task of assisting the Dean in leading the implementation of education, research, and community service. 2) The Deputy Dean for General Finance, who has the task of assisting the Dean in leading the implementation of activities in the fields of (a) planning, (b) finance, (c) general administration, and (d) information systems. 3) The Deputy Dean for Student and Alumni Affairs, who has the task of assisting the Dean in leading student and alumni affairs activities.
Faculty Senate	The Senate of Faculty of Teacher Training and Education UNMUL is a normative body and the highest representative in Faculty which has the authority to outline policies and regulations at the faculty level.
Faculty Quality Assurance Group	The Faculty Quality Assurance Group at Faculty of Teacher Training and Education UNMUL is a system in determining and fulfilling quality standards for educational management at UNMUL consistently and continuously. The Faculty Quality Assurance Group aims to maintain and improve the quality of education in a sustainable manner, which is carried out by the Teaching and Education Faculty of UNMUL internally to realize its vision and mission, and to meet the needs of stakeholders through the implementation of the Tridharma of Higher Education (three obligations of lecturers in universities)
The Head and Secretary of the Mathematics and Natural Sciences Education Department **Prof. Dr. Mukhamad Nurhadi, M.Si. and Dr. Abdul Hakim, M.Pd.**	Head and Secretary of Mathematics and Natural Sciences Education Department has the task of carrying out administrative management, strengthening human resources to support the achievement of the tri dharma of higher education and student affairs, in addition to coordinating several Departments in the fields of Mathematics and Natural Sciences, including Physics Education Department in implementing education and teaching, research, and community service in a branch of scientific disciplines as well as carrying out activities that support the implementation of the Faculty of Teacher Training and Education programs.
Coordinator of the Physics Education Study Program	The Department Coordinator has the following task details. 1) Assisting the head of the department's duties in implementing academic quality, research, and community service (Tri

Position	Tasks/Functions
Dr Riskan Qadar, M.Si.	Dharma Perguruan Tinggi) at the Department level. 2) Working together with department heads and department secretaries in carrying out academic quality assurance. 3) Working together with department heads and department secretaries in preparing Department work plans and programs as work guidelines. 4) Assigning the lecturers who teach the courses each semester. 5) Assigning the Field Practice and Thesis supervisors as well as examiners. 6) Evaluating students' length of study. 7) Monitoring the development of student academic achievement 8) Supervising the course plan preparation 9) Submitting reports on the implementation of educational, research, and community service activities regularly to the head of the department as the basis for the department's report to the Dean 10) Preparing reports and the Study Program self-evaluation
Head of the Physics Education Laboratory **Dr. Zeni Haryanto, M.Pd.**	The head of the laboratory has the following duties: 1) Preparing the operational plans and laboratory development. 2) Providing services for the academic community to develop science and technology. 3) Preparing a schedule of academic activities carried out in the laboratory. 4) Supervising all academic activities carried out in the laboratory as well as guiding the laboratory personnel. 5) Collaborating with external parties in the context of resource sharing and laboratory empowerment. 6) Monitoring and evaluating the availability of infrastructure and activities in the laboratory/studio. 7) Reporting the activities at least every semester to the Head of the Department. 8) Working with the expert group of lecturers to develop a research umbrella.
Lecturers in Physics Education Study Program	The main tasks are conducting education and teaching, research, and community service. Lecturers are also academic supervisors for several students, providing guidance and advice to students regarding various problems encountered during their education. Apart from being an academic supervisor, the lecturer also acts as a thesis supervisor.
Mathematics and Science Education Department Staff	Mathematics and Science Education Department staff is in charge of assisting administrative work and documentation related to academic activities and managing the Mathematics and Science Education Department database.

The main teaching staff in the Physics Education Study Program consists of 12 lecturers and supporting lecturers at both the University and Faculty levels to support compulsory university, Faculty, and Department of Mathematics and Natural Sciences courses. The list of prominent lecturers can be seen in Table 6 below:

Table 6. List of Lecturers and Expertise Fields

No	Lecturer Name	Areas of expertise
1	Prof. Dr. Lambang Subagiyo, M.Si	Environmental Physics and Modern Physics
2	Dr M. Junus, M.Pd	Basic Physics and Mechanics
3	Dr Riskan Qadar, M.Si	Learning Assessment and Optics

4	Dr Laili Komariyah, M.Si	Environmental Physics and Mathematical Physics
5	Dr Zulkarnaen, M.Si	Middle School Curriculum and Mathematical Physics
6	Dr Zeni Haryanto, M.Pd	Basic Physics and Pedagogical Content Knowledge (PCK)
7	Dr Abdul Hakim, M.Pd	Technology in Learning Physics and Thermodynamics
8	Muliati Syam, M.Pd	Basic Physics and Physics Learning
9	Nurul Fitriyah Sulaeman, M.Pd., Ph.D.	Assessment and Integrated Physics Learning
10	Shelly Efwinda, M.Pd	PCK and Technological Pedagogical Content Knowledge (TPACK)
11	Atin Nuryadin, M.Si	Material Physics and Technology in Physics learning
12	Puardmi Damayanti, M.Pd	Space Earth and Technology in Learning Physics

The transparency of study program management is coordinated by the lecturer who serves as the coordinator of the study program supported by the head of laboratory, lecturers and laboratory assistants (Agus Riyadi, S.Pd). The organizational structure can be observed on the http://fisika.fkip.unmul.ac.id/profil/3/Management.html.

Apart from managing study programs, transparency of the curriculum and academic system is also facilitated in the Academic Information System via the https://sia.unmul.ac.id/login. Students can decide which courses to choose at the beginning of the semester, including checking the lecturer's name and the score at the end of the semester online. Using the same system, lecturers can input grades for each course. This system also helps study programs to evaluate graduates' quality, indicated by the Grade Point Average (GPA) and study length.

The improvement of the information system as a whole has also streamlined:

a. the teaching and learning process and academic activities (such as lectures, research for thesis completion),
b. increased easy access to the latest information (internet access and textbook procurement) and,
c. created a more comfortable and conducive teaching and learning process.

Other supporting technical units are also being actively developed, one of them is the Faculty Library that continuously adding the collection and reference for more than 10 thousand titles.

9. Assessment and Evaluation

a. Assessment of Learning Outcomes

Assessment Standards in the Physics Education Study Program include: 1) assessment principles, 2) assessment techniques and instruments, 3) mechanisms and procedures for

evaluation, 4) implementation, 5) reporting and 6) student graduation by the National Higher Education Standards by the government as stipulated in Regulation of the ministry of education and culture Republic of Indonesia number 3, 2020.

The Principles of Assessment include educational, authentic, objective, accountable, and transparent, carried out in an integrated manner. Learning assessment is also based on the Assessment Guidelines from UNMUL. Assessment procedures and mechanisms are carried out under the stipulated provisions. The Physics Education Study Program and the Faculty prepare a schedule for midterm and final semester exams held in the current semester.

The type of assessment used is arranged by lecturer who teaches each subject with a wide selection of assessment techniques that can be applied. Assessment techniques consist of observation, participation, performance, written tests, oral tests, and questionnaires, either one or a combination, among others. The final result of the assessment is an integration between the various techniques and assessment instruments used.

The Physics Education Study Program instructs lecturers to make assessment instruments by the expected learning outcomes. When giving questions, it is advisable to use problems with varying levels of difficulty, not just questions that are low order thinking skills (LOTS), but also questions that are high order thinking skills (HOTS). Students' assignments are expected to develop students' critical thinking skills to analyze problems from various perspectives, provide multiple alternative problem-solving solutions or be creative and innovative, referred to critical pedagogy.

The Assessment Mechanism begins by compiling, conveying, agreeing on stages, techniques, instruments, criteria, indicators, and weight of assessments between lecturers and students in the Learning plan. Then, carry out the appraisal process by the stages, techniques, instruments, criteria, indicators and importance of the assessment which contain the principles of evaluation; provide feedback and the opportunity to question the results of the assessment to students, and documenting the assessment of student learning processes and outcomes in an accountable and transparent manner.

The assessment and evaluation system is carried out from the course level, which guarantees the Programme Learning Outcomes/PLO's achievement to the entire program's completion level through the average GPA and alumni success evaluation after graduation. Assessment at the course level adjusted by Learning Outcomes that students need to achieve in the course The assessment aims to:

1) determine whether the learning process has succeeded in facilitating students to achieve learning objectives or not

2) what improvements need to be improved so that unattainable goals can be achieved.

The assignment of subject scores can refer to one of the schemes as presented in Table 7 and the conversion of achieved score could be seen in Table 8.

Table 7. Reference to Percentage of Grading Guideline

Scheme	Cognitive		Psychomotor		Affective	Total
	Mid Test	Final Exam	Practicum	Task		
I	20	40	20	10	10	100
II	30	40	20	-	10	100
III	45	45	-	-	10	100
IV	40	50	-	-	10	100
V	30	40	-	20	10	100
VI	-	40	50	-	10	100
VII	-	50	10	30	10	100

Table 8. Grading Guideline

Score	Value Weight	Grade
$0 \leq$ Score < 40	0.0	E
$40 \leq$ Score < 50	1.0	D
$50 \leq$ Score < 60	1.5	
$60 \leq$ Score < 65	2.0	C
$65 \leq$ Score < 70	2.5	
$70 \leq$ Score < 75	3.0	B
$75 \leq$ Score < 80	3.5	
$80 \leq$ Score < 100	4.0	A

b. Lecture Monitoring and Evaluation

Lecture activities: face-to-face lectures, practicum, and field work or internships need to be managed and regularly monitored every semester. The goal is that educational services in the Faculty or Study Program meet the high-quality standards and provide satisfaction to students and graduate users. Monitoring and evaluating are also intended to ensure that the quality standards that have been achieved can be maintained, improved, or maximized to gain qualifications that are above national standards or reach international standards.

The Faculty carries out this monitoring and evaluation by involving The Faculty Quality Assurance Group, administrative staff, and students. Faculties and study programs prepare the Guidelines for Lecture Monitoring and Evaluation, monitoring instruments, and applications to process and monitor the results. The results of this monitoring will be used to evaluate the learning activities and followed by improving it. The Faculty Quality Assurance Group uses the Improvement cycle as an internal quality assurance system.

10. Curriculum Evaluation System

The basis for preparing the curriculum refers to Presidential Regulation of Indonesia Number 8 of 2012 concerning the Indonesian National Qualifications Framework and Law Number 12 of 2012 concerning Higher Education. To implement curriculum quality assurance, the Physics Education Study Program of UNMUL refers to the Regulation of the Minister of Education and Culture Number 3 of 2020 concerning National Higher Education Standards. The national standards that are the basis for preparing the curriculum for study programs at FKIP UNMUL are graduate competency standards, learning content standards, learning process standards, and learning education assessment standards.

Implementing curriculum quality assurance in the Physics Education Study Program refers to the FKIP UNMUL quality document. This document consists of a quality policy, a quality manual and quality standards, standard operating procedures, and instructions. The quality manual document clearly states that FKIP UNMUL carries out quality assurance with the Improvement cycle (Determine, Implement, Evaluate, Control, Improve) (illustrated in Figure 11):

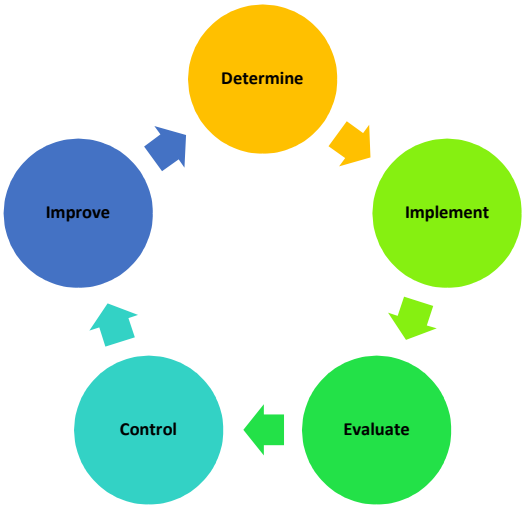

Figure 11. Curriculum Evaluation Cycle

Based on this, curriculum quality assurance in the Physics Education Study Program also follows the Improvement cycle, consisting of Standard Setting, Standard Implementation, Standard Implementation Evaluation, Standard Control, and Standard Improvement.

In setting standards, the Physics Education Study Program refers to the following criteria:

a. Graduate competency standards (SM / FKIP / SPMI-03-01)
b. Learning content standard (SM / FKIP / SPMI-03-02)
c. Learning process standard (SM / FKIP / SPMI-03-03)
d. Learning education assessment standards (SM / FKIP / SPMI-03-04)

To guarantee the quality of curriculum implementation, the Physics Education Study Program has compiled:

a. General guidebook for the implementation of learning
b. Learning guidebook related to research and community service
c. Semester learning plan document for all courses
d. Learning materials
e. Practical guidelines
f. Learning assessment document

To ensure the quality of the curriculum in the Physics Education Study Program, the Faculty monitors and evaluates the aspects below:

a. The suitability of the content of learning materials to the learning plan
b. The suitability of the learning implementation process to the learning plan
c. The suitability of the learning process related to research and community service
d. The suitability of the method with learning outcomes
e. The suitability of meeting the hours of learning theory and practice based on the standards of the learning process.

The Faculty Quality Assurance Group formed a monitoring and evaluation team to carry out the monitoring and evaluation at the faculty level. This team is in charge of evaluating the implementation of learning in the Physics Education Study Program. The monitoring and evaluation data become the basis for proceeding to the next stage, namely quality control.

In the quality control stage, interpreting and concluding compliance with all curriculum standards is carried out. In this stage, four categories of assessment results are determined: exceeding standards, reaching standards, not reaching standards, and deviating from standards. The assessment results form the basis for carrying out the next stage, namely increasing standards.

The standard improvement stage is carried out in the Management Review Meeting held at the end of each semester. This activity is attended by a team of lecturers from the Study Programs, the Departments and Faculty representatives, as well as the Faculty Quality Assurance Team. In this activity, the results of the previous stages are presented. Then, all participants held discussions related to determining fixed and improved standards.

TESTIMONIALS OF GRADUATES OF THE PHYSICS EDUCATION PROGRAM

As an Alumni of the Physics Education Study Program, I am grateful that I have received a lot of beneficial knowledge and skills that delivered by competent lecturers. The teaching and learning skills in physics education are useful in my life and inspire me to become an educator that needs to educate my students with knowledge, skills and noble character. From my study, I am confident and determined to become a professional Physics Teacher as I am now.

Darmadianingsih,S.Pd
(Alumni 1993, High School Physics Teacher, SMAN 3 Samarinda, 1998 - now)

The Physics Education Study Program has professional and experienced lecturers who are capable of transferring knowledge, skills, and experiences to students so that I, as an Alumni, can apply it in my current job.

Active experiences in the Physics Education laboratory has also provided useful skills in exploring Physics as the foundation for the science and technology that I am using on in my current job as university lecturer.

Hadi Santoso, S.Pd., M.Si
(Alumni 2007, Lecturer, Mechanical Engineering Program Faculty of Engineering, Borneo Tarakan University, Indonesia)

I gained a lot of valuable knowledge & experience while studying at the Physics Education Study Program. The analytical, problem-solving skills and accuracy in data processing are beneficial in my current job, especially in an oil & gas company. The job has high demands; therefore, those skills are essentials.

Besides, the Physics Education Study Program's learning environment is very fun and enjoyable with educators who are competent in their fields.

Lukas Pundu, S.Pd
(Alumni 2013, Database Administrator, Oil & gas company, Pertamina Hulu Mahakam)