SUMMARY OF CURRICULUM



UNDERGRADUATE PROGRAM OF PHYSICS EDUCATION
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS NEGERI SURABAYA
2025

CURRICULUM SUMMARY
UNDERGRADUATE PROGRAM OF PHYSICS EDUCATION (UPPE)

A. OBJECTIVE OF THE DEGREE ROGRAM

The Undergraduate Program of Physics Education (UPPE) belongs to Faculty of Mathematics and Natural Sciences (FMNS) at Universitas Negeri Surabaya (UNESA). UPPE was established on **July 31st, 1984** with the **Decree of the Director General of Higher Education Ministry of Education and Culture of the Republic of Indonesia No. 61/DIKTI/Kep/1984**.

In 2022, Unesa officially changed its institutional status from a Public Service Agency (Badan Layanan Umum/BLU) to a State University with Legal Entity (Perguruan Tinggi Negeri Berbadan Hukum/PTNBH) status. Following this transition, Unesa established new institutional vision and missions as a State University with Legal Entity status. **Objectives of this study program were derived from the visions and missions of institution and faculty as detailed in the following paragraphs.**

1. The Vision and Mission of Institution (Unesa)

Vision:
"Becoming a strong, adaptive, and innovative educational university based on entrepreneurship"

Missions:
a. To provide education in both educational and non-educational fields that is strong, adaptive, and innovative, based on entrepreneurship;
b. To conduct research and enhance the quality of innovation in educational and non-educational fields with an entrepreneurial foundation;
c. To carry out community service and disseminating innovations in educational and non-educational fields with an entrepreneurial basis for the welfare of society;

d. To implement the Tridharma of higher education through a multi-campus system in a synergistic, integrated, harmonious, and sustainable manner, while upholding Unesa's strengths;
e. To organize governance that is effective, efficient, transparent, and accountable, ensuring continuous quality improvement;
f. To establish productive national and international collaborations to create, develop, and disseminate innovations in educational and non-educational fields with an entrepreneurial foundation.

2. The Vision and Mission of Faculty of Mathematics and Natural Sciences (FMNS)

Vision:
""Becoming a resilient, adaptive, innovative, and collaborative Faculty of Mathematics and Natural Sciences based on *edu-ecopreneurship* and gaining international recognition"

Missions:

1. To organize research-based education in the field of education and non-education of Mathematics and Natural Sciences that is adaptive, innovative, collaborative, and characterized by *edu-ecopreneurship*;
2. To conduct research and improving the quality of innovation in the field of MIPA education and non-education through global collaboration;
3. To organize community service and disseminating innovations in the field of MIPA education and non-education for community empowerment;
4. To organize effective, efficient, transparent and accountable governance in FMIPA;
5. To establish productive national and international cooperation to create, develop, and disseminate innovations in the fields of MIPA education and non-education.

3. The Vision of Undergraduate Program of Physics Education (UPPE)

Vision

To become a Center for the Development of Physics Education Studies that is adaptive, resilient, innovative, collaborative, and has an Edu-Ecopreneurship spirit in implementing STEM-based Physics education science and obtaining national and international recognition by 2035.

4. Program Educational Objectives (PEOs) of UPPE

As a consequence of the vision and mission of the institution (i.e. Unesa and FMNS) as well as the mandate of **Rector Decree, i.e. SK No. 466/UN38/HK/DT/2016** to change the teaching paradigm into student-centered learning and outcome-centered learning, the Program Educational

Objectives (PEOs) of the Undergraduate Program of Physics Education (**UPPE**) focus on producing graduates who are capable of becoming reliable professionals, leaders and agents of change in society with adequate capability to be responsive and adaptive to the challenges met.

The undergraduate programme of Physics Education produces professionals who at the beginning of their careers become Physics educators. However, there are a possibility that the graduates of Physics education have the ability to be laboratory managers, employees of educational institutions, entrepreneurs, research assistants; have the ability to continue their studies to a higher level of education and have a superior character, environmental insight, and entrepreneurial spirit that able to compete at national and international level. In detail, the PEOs are as follows:

1) Having capability in using pedagogical knowledge and skills to solve problems in work (**PEO 1**).
2) Having a strong commitment to developing knowledge, whether further study or working formally or informally (**PEO 2**).
3) Mastering scientific methods to analyse and develop innovations in learning physics and produce scientific work and contribute in their fields (**PEO 3**).
4) Mastering the fields of physics and learning, can apply their knowledge and expertise in various fields of work and can develop themselves in their career environment (**PEO 4**)
5) Having capability in communicating orally and or in writing effectively, creatively, innovatively, and collaboratively while working in teams or individually (**PEO 5**)

The formulated PEOs have extensively considered the inputs from academic staff meeting of the UPPE and the FMNS, alumni, professionals**, Physics Society Indonesia** (**PSI**). The PEOs also have significant relevancies with the **Indonesian Qualification Framework** (**IQF**).

1) Being able to apply their field of expertise and utilising science and technology in their fields in problem-solving and being able to adapt to the situation at hand (**IQF 1**).
2) Mastering theoretical concepts in a particular field of knowledge in general and the theoretical concepts of special sections in that field of knowledge in-depth, as well as being able to formulate procedural problem-solving (**IQF 2**).
3) Able to make appropriate decisions based on analysis of information and data, and be able to provide guidance in choosing alternative solutions independently and in groups (**IQF 3**).

4) Be responsible for the work itself and can be given responsibility for the achievement of the work of the organisation (**IQF 4**).

Table 1. The relation between PEO and IQF

Objectives	IQF 1	IQF 2	IQF 3	IQF 4
PEO 1	S	S	S	M
PEO 2	S	S	S	S
PEO 3	S	S	S	M
PEO 4	S	S	S	S
PEO 5	S	S	S	S

Note: S-Strong; M-Moderate

Interpretation of "Strong" (S)

A Strong (S) relationship means that the PEO:

- Directly supports the development of competencies described in the corresponding **IQF** level.
- Is explicitly reflected in the curriculum structure, learning outcomes (CPL/CPMK), and assessment strategies.
- Has clear evidence in course content, teaching methods, and graduate attributes.
- Example: If PEO 2 is marked "S" across **IQF** 1–4, it likely contributes to foundational knowledge, applied skills, autonomy, and managerial competence.

Interpretation of "Moderate" (M)

A Moderate (M) relationship means that the PEO:

- Partially supports the **IQF** level, possibly in an indirect or complementary way.
- May be integrated across multiple courses but not dominant in any single one.
- Has some evidence in learning activities or graduate profiles, but may require enhancement or clearer mapping.
- Example: PEO 1 and PEO 3 show "M" at **IQF** 4, suggesting they contribute to managerial or leadership competencies, but not as strongly as other PEOs.

5. Program Learning Outcomes (PLOs) of UPPE

a. Competencies, Aspects and PLOs Description

Derived from the PEOs, the UPPE has the following Program Learning Outcomes (PLOs) for its graduates set:

Table 2. PLOs of UPPE

Competency SSC-ASIIN	Aspects	PLO	DESCRIPTION
Social competences	**Attitudes 1 (AT1)**	PLO 1	Demonstrates religious, national and cultural values, as well as academic ethics in carrying out their duties.
	Attitudes 2 (AT2)	PLO 2	Demonstrates a resilient, collaborative, adaptive, innovative, inclusive, lifelong learning, and entrepreneurial character.
	General Skills 1 (GS1)	PLO 3	Develops logical, critical, systematic and creative thinking in carrying out specific work in the field of expertise and in accordance with the work competency standards in the relevant field.
	General Skills 2 (GS2)	PLO 4	Develops self sustainably and collaborate.
Specialist competences	**Knowledge 1 (KN1)**	PLO 5	Masters and demonstrates the principles of classical and modern physics theory.
	Knowledge 2 (KN2)	PLO 6	Formulates physical symptoms and problems based on the results of observations and experiments, and model them using mathematics and computing for appropriate decision making in both familiar and new problems.
	Knowledge 3 (KN3)	PLO 7	Masters the pedagogical knowledge in planning, teaching, and evaluating physics learning as well as resource management in organizing classes, physics laboratories and educational institutions.
	Special Skills 1 (SS1)	PLO 8	Conducts physics education research in the form of studies and evaluations of physics learning with a quantitative and/or qualitative approach in the form

Competency SSC-ASIIN	Aspects	PLO	DESCRIPTION
			of oral and academic writing effectively.
	Special Skills 2 (SS2)	PLO 9	Masters the principles of developing physics learning media based on science, contextual technology, especially ICT (information and communication technology), and the surrounding environment.

b. Correlation between the PEOs and the PLOs

Table 3. Matrix of the Correlation between PEOs and the Programme PLOs of UPPE

Competency SSC-ASIIN	Aspects	PLO	PEO 1	PEO 2	PEO 3	PEO 4	PEO 5
Social competences	**Attitudes (AT)**	**PLO 1**	√	×	×	×	×
		PLO 2	√	×	×	×	√
	General Skills (G)	**PLO 3**	√	√	√	×	×
		PLO 4	×	√	×	√	×
Specialist competences	**Knowledge (KN)**	**PLO 5**	×	√	×	√	×
		PLO 6	×	√	√	√	×
		PLO 7	√	×	√	×	×
	Special Skills (SS)	**PLO 8**	√	√	×	×	√
		PLO 9	√	×	√	×	√

***** √-***Yes,*** ×-***No***

Interpretation:

- A check mark (√) indicates an explicitly mapped PLO–PEO relationship; a cross (×) indicates that no direct relationship is claimed in this matrix.
- An unmapped relationship is not, by itself, evidence of a missing competence; each mapping must be justified through module outcomes and assessments.
- PLO 1 is mapped to PEO 1 only, emphasizing ethical and professional attitudes in pedagogical practice.
- PLOs 2–4 have selective links with PEOs 1, 2, 3, 4 and 5, as indicated by the check marks in Table 3.
- PLOs 5–7 contribute specifically to physics knowledge, disciplinary methods and pedagogical competence rather than every PEO.
- PLOs 8–9 contribute to educational research and learning media, as reflected in their explicitly selected PEO relationships.

The matrix presents selective and differentiated relationships between PLOs and PEOs; not every PLO is directly mapped to every PEO. This approach can make constructive alignment more transparent when justified by module learning outcomes and assessment evidence. The combined coverage of the five PEOs by the PLO set indicates the intended breadth of graduates' competencies, while individual mappings remain selective.

c. Mapping of Subject-Specific Criteria (ASIIN) with Programme Learning Outcomes (PLO)

Table 4. The mapping of SSC ASIIN and PLO

ASIIN Subject Specific Criteria for Physics (ASIIN-SSC)		Programme Learning Outcome (PLO)								
		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
		AT1	**AT2**	**GS1**	**GS2**	**KN1**	**KN2**	**KN3**	**SS1**	**SS2**
1	They have sound knowledge of classical physics (mechanics, electrodynamics, thermodynamics, vibrations, waves and optics) and are familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid-state physics.			√	√	√				
2	They are familiar with important mathematical methods used in physics and can use these to solve physics problems.			√	√		√			
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.					√	√	√		
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.	√						√	√	
5	They have a basic capacity to comprehend physics problems. This will in general however not yet facilitate a deeper understanding of current research areas.							√	√	√
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.		√	√					√	√
7	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.					√	√	√		

ASIIN Subject Specific Criteria for Physics (ASIIN-SSC)		Programme Learning Outcome (PLO)								
		PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9
		AT1	**AT2**	**GS1**	**GS2**	**KN1**	**KN2**	**KN3**	**SS1**	**SS2**
8	They have generally also acquired an overview knowledge in selected other natural science subjects or technical disciplines.			√					√	√
9	They are able to apply their knowledge to different fields and act responsibly in their professional activity. They are moreover able to recognize new trends in their subject area and integrate the relevant methodology – possibly after appropriate qualification – into their further work.			√	√			√	√	
10	They are able to continuously and self-reliantly 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 capable of a consecutive Master's degree programme in principle.				√	√	√	√		
11	They have gained initial experience with regard to generic qualifications (e.g. time man-agreement, study and work techniques, willingness to cooperate, capacity for teamwork, ability to communicate and communication techniques, rules of good scientific practice) in their degree programme, and are able to develop these skills further.	√		√	√					
12	They are familiar with the basic elements of the relevant specialised English.	√		√	√					
13	They are able to solve a simple scientific problem and to present their results orally (lecture) and in writing (demonstrated in a Bachelor's thesis).		√	√					√	√

B. PROGRAM STRUCTURE

The enhancement of the UPPE's curriculum was driven by a comprehensive evaluation of current conditions and anticipated future demands in the field of physics education. This process considered both national priorities and global challenges, as illustrated in **Figure 1**.

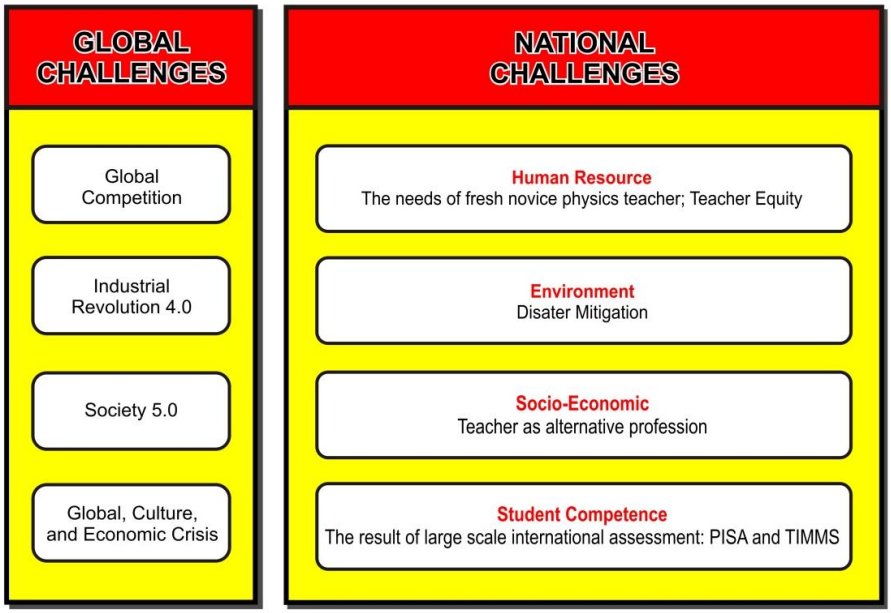


Figure 1. Recognized Challenges in the Field of Physics Education

Responding to these dynamics, the curriculum structure and course syllabi were revised and applied during **the 2019–2023** period. Building on this foundation, the program has now adopted a **Transformative Curriculum for the 2024–2028 cycle**, designed to foster adaptability, innovation, sustainability and *edu-ecopreneurship*.

The UPPE's curriculum has been continuously refined through active engagement with internal and external stakeholders. Inputs from lecturers, students, alumni, school partners, and industry representatives have shaped its relevance to both classroom realities and future professional demands. These contributions informed the 2019–2024 curriculum revision and now support the implementation of the Transformative Curriculum (2024–2028). Annual evaluations ensure the curriculum remains responsive to evolving challenges and opportunities.

1. Proposed curriculum structure

The curriculum of the UPPE is delivered in 4 phases/years through 3 main structures: basic knowledge, expertise knowledge and synthesis, as illustrated in Figure 2. In this structure, the learning process to gain competence is modelled as a house. Basic knowledge is the foundation of the programme, expertise knowledge as the pillars, and the synthesis of knowledge as the roof which integrates the professional knowledge and competencies of Physics Education.

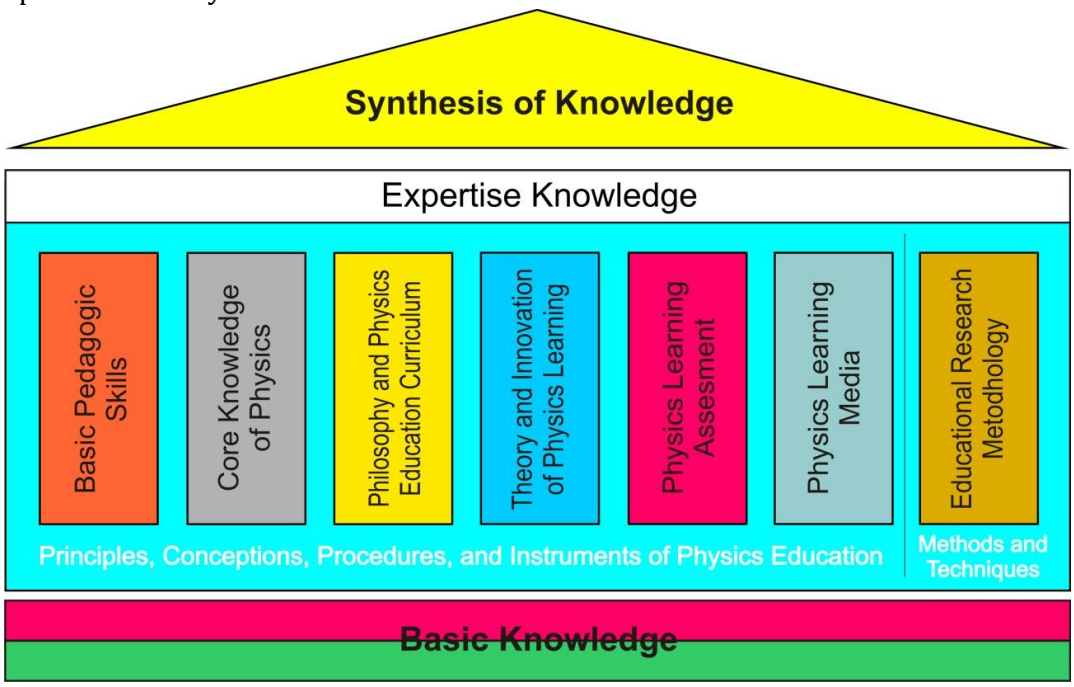


Figure 2. Physics Education's Curriculum Structure

The UPPE curriculum requires students to complete at least 145 Credit Units (CU), equivalent to 230.55 ECTS. The updated semester-by-semester course offerings and elective-selection ceilings shown in Table 5 provide an illustrative study-plan allocation of up to 168 CU (267.12 ECTS) across eight semesters; this aggregate must not be interpreted as a new graduation requirement. The semester workload each student may register depends on their previous-semester GPA and applicable UNESA academic regulations.

Note:

1 According to UNESA Rector Decree No. 736/HK/KM/2023 as cited in the submitted SAR, 1 CU corresponds to 170 minutes per week over 16 weeks (approximately 45.33 workhours per semester). Course-specific workload, including self-study, laboratory work, internship and thesis activity, must be documented in the relevant module description.

2 The CU-to-ECTS conversion used consistently in this document is 1 CU = 1.59 ECTS, as specified in the submitted SAR. Values displayed in the curriculum tables are calculated as CU × 1.59.

2. Model of curriculum structure

The updated semester course structure and credit information are presented in Table 5, based on the supplied "The UPPE Curriculum Structure.xlsx" (29 October 2026). The figures distinguish compulsory courses, electives offered, maximum elective selection, planned workload and semester registration ceilings.

Table 5. The UPPE Curriculum Structure

SEMESTER 1				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420302188	Physical Measurement System	2	3.18
2	8420302236	Learning Theories	2	3.18
3	8420303106	General Chemistry	3	4.77
4	8420303291	Calculus for Physics	3	4.77
5	8420302275	Basic of Education	2	3.18
6	8420302030	General Biology	2	3.18
7	8420304294	Basic Mechanics and Thermodynamics	4	6.36
8	1000002018	Pancasila	2	3.18
Total			**20**	**31.80**
Maximum Semester Workload			**20**	**31.80**
SEMESTER 2				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420304292	Series and Linear Algebra for Physics	4	6.36
2	8420303279	English for Physics	2	3.18
3	8420302250	School Curriculum	2	3.18
4	8420304295	Basic Electromagnetism and Optics	4	6.36
5	1000002047	Physical Education and Fitness	2	3.18
6	8420302107	Conservation of Natural Resources and Environment	2	3.18
7	842030223x	Religious Education	2	3.18
8	1000002033	Civics	2	3.18
Total			**20**	**31.80**
Maximum Semester Workload			**20**	**31.80**

SEMESTER 3				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420303218	Thermodynamics	3	4.77
2	8420303296	Electronic Circuits	3	4.77
3	8420304130	Mechanics	4	6.36
4	8420303081	Waves	3	4.77
5	8420304293	Special Functions for Physics	4	6.36
6	1000002003	Indonesian	2	3.18
7	8420302224	Entrepreneurship	2	3.18
8	1000002046	Digital Literacy	2	3.18
Total			**23**	**36.57**
Maximum Semester Workload			**24**	**38.16**
SEMESTER 4				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420303076	Modern Physics	3	4.77
2	8420303135	Research Methodology	3	4.77
3	8420303297	Electronica	2	3.18
4	8420303115	Electricity and Magnetism	3	4.77
5	8420302287	Learning Media	2	3.18
6	8420302283	Learning Plan	2	3.18
7	8420302288	Teaching Skill and Micro Learning	2	3.18
8	8420302240	Evaluation of Study and Learning	2	3.18
9	8420302197	Statistics	2	3.18
Total			**21**	**33.39**
Maximum Semester Workload			**24**	**38.16**

SEMESTER 5				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420302144	Optics	2	3.18
2	8420302099	Earth and Space Science	2	3.18
3	8420303069	Quantum Physics	3	4.77
4	8420303301	School Physics Curriculum Analysis***	3	4.77
5	8420304307	Applications of Statistics in Physics Education***	4	6.36
6	1000020158	Critical and Creative Thinking***	2	3.18
7	1000020163	Communication Skills***	2	3.18
8	8420304309	Community Physics***	4	6.36
9	8420302308	Socio-Scientific Issues (SSI) in Society***	2	3.18
10	8420302311	Entrepreneurship Practice***	2	3.18
11	8420304310	Physics Reasoning***	2	3.18
12	8420303306	Sustainable Physics Education***	3	4.77
Compulsory Courses			**7**	**11.13**
Elective Courses Offered			**24**	**38.16**
Maximum Electives Taken			**15**	**23.85**
Total Semester Workload			**22**	**34.98**
Maximum Semester Workload			**24**	**38.16**

SEMESTER 6				
No	**Code**	**Course title**	**CU**	**ECTS**
1	MBKM0032	PLP Program Planning	2	3.18
2	MBKM0031	PLP Program Evaluation	2	3.18
3	8420303077	Schools Physics	3	4.77
4	8420306276	Innovative Learning**	3	4.77
5	8420303313	Application of Physics Learning Media**	3	4.77
6	8420303312	Development of Physics Teaching Materials**	3	4.77
7	8420304314	Physics Teaching Practice**	4	6.36
8	8420303302	Observation of School Physics Assessment***	3	4.77
9	8420303304	Observation of School Physics Learning Media***	3	4.77
10	8420303303	Observation of Innovative School Physics Learning***	3	4.77
Compulsory Courses			**7**	**11.13**
Elective Courses Offered			**22**	**34.98**
Maximum Electives Taken			**15**	**25.44**
Total Semester Workload			**22**	**34.98**
Maximum Semester Workload			**24**	**38.16**

SEMESTER 7				
No	**Code**	**Course title**	**CU**	**ECTS**
1	8420303068	Nuclear Physics	3	4.77
2	8420303080	Solid Physics	3	4.77
3	8420303078	Statistical Physics	3	4.77
4	8420302108	Physics Laboratory*	2	3.18
5	8420302243	Philosophy of Sciences*	2	3.18
6	8420302254	Physics Local Wisdom*	2	3.18
7	8420302268	Physics Argumentation*	2	3.18
8	8420302265	STEAM Learning*	2	3.18
9	8420302253	Physics e-learning*	2	3.18
10	8420302269	Physics Edutainment*	2	3.18
11	8420302264	Measurement and Instruments of Physics Education*	2	3.18
12	8420302260	Item Response Theory*	2	3.18
13	8420302270	Digital Based Assessment*	2	3.18
14	8420302252	Audiovisual Physics*	2	3.18
15	8420302143	Multimedia*	2	3.18
16	8420302259	Physics Communication and Media Analysis*	2	3.18
Compulsory Courses			**9**	**14.31**
Elective Courses Offered			**26**	**41.34**
Maximum Electives Taken			**12**	**19.08**
Total Semester Workload			**21**	**33.39**
Maximum Semester Workload			**24**	**38.16**

SEMESTER 8				
No	**Code**	**Course title**	**CU**	**ECTS**
1	1000002104	Final Project Proposal	2	3.18
2	1000002105	Final Project	4	6.36
3	8420302052	Renewable Energy*	2	3.18
4	8420302079	Applied Physics*	2	3.18
5	8420302063	Earth Science*	2	3.18
6	8420302261	Earth Disaster Mitigation*	2	3.18
7	8420302266	Robotics Physics*	2	3.18
8	8420302061	Space Physics*	2	3.18
9	8420302183	History of Physics*	2	3.18
10	8420302245	Physics Literacy*	2	3.18
11	8420302098	Integrated Science*	2	3.18
12	8420302253	21st Century Physics Learning*	2	3.18
13	8420302316	Standard Assessment Study*	2	3.18
14	8420302263	Olympiad of Physics*	2	3.18
15	8420302246	Physics of Photography*	2	3.18
Compulsory Courses			**6**	**9.54**
Elective Courses Offered			**26**	**41.34**
Maximum Electives Taken			**12**	**19.08**
Total Semester Workload			**18**	**28.62**
Maximum Semester Workload			**24**	**38.16**

Source-control note: The updated worksheet resolves the earlier semester-4 19/21-CU listing by including Teaching Skill and Micro Learning (2 CU) and Statistics (2 CU) among nine courses; however, its detailed semester-5 rows state 7 compulsory CU and 15 selected elective CU, while a separate summary in the same worksheet still states 9 and 13 CU. Table 5 and the credit distribution below follow the detailed course list. Verify the official SIAKAD curriculum before publication. Statistical Physics remains 3 CU (4.77 ECTS).

3. Calculation of ECTS

Table 6. Summary of planned Credit Units (CU) and ECTS by semester (based on detailed course listings)

No	Semester	CU	ECTS
1	1st Semester	20	31.80
2	2nd Semester	20	31.80
3	3rd Semester	23	36.57
4	4th Semester	21	33.39
5	5th Semester	22	34.98
6	6th Semester	22	34.98
7	7th Semester	21	33.39
8	8th Semester	18	28.62
8 semesters		**167**	**265.53**

Table 7. Credit distribution and maximum semester workload

Semester	Compulsory CU (ECTS)	Electives offered CU (ECTS)	Maximum selected CU (ECTS)	Planned CU (ECTS)	Conditional ceiling CU (ECTS)
1	20 (31.80)	—	—	20 (31.80)	20 (31.80)
2	20 (31.80)	—	—	20 (31.80)	20 (31.80)
3	23 (36.57)	—	—	23 (36.57)	24 (38.16)
4	21 (33.39)	—	—	21 (33.39)	24 (38.16)
5	7 (11.13)	24 (38.16)	15 (23.85)	22 (34.98)	24 (38.16)
6	7 (11.13)	22 (36.57)	15 (25.44)	22 (36.57)	24 (38.16)
7	9 (14.31)	26 (41.34)	12 (19.08)	21 (33.39)	24 (38.16)
8	6 (9.54)	26 (41.34)	12 (19.08)	18 (28.62)	24 (38.16)

Notes on Credit Units (CU), ECTS, and Academic Requirements

- **Electives Offered:** Total Credit Units (CU) of elective courses available in a semester; the entire basket is not required.
- **Maximum Electives Taken:** Maximum CU students may select from available elective courses, subject to the approved study plan and course availability.
- **Course Selection:** Based on academic interests, curriculum requirements, prerequisites, and the approved semester study plan.
- **Maximum Semester Workload:** The actual CU a student may register is determined by the previous-semester Grade Point Average (GPA) in accordance with UNESA academic regulations; the 24-CU ceiling in the source worksheet is conditional and may exceed the planned workload.
- **Minimum Credits for Graduation:** Students must successfully complete at least 144 CU (230.55 ECTS), including all compulsory requirements.
- **Minimum Graduation GPA:** A cumulative GPA of 2.75 is required.
- **Academic Approval:** Course registration must comply with applicable CU limits and receive academic advisor approval.
- **ECTS Conversion:** 1 CU = 1.59 ECTS (used consistently for all displayed course-level and summary calculations).

Table 8. Distribution of Credit Units for UPPE Courses

Course Category	CU	Note
Compulsory	113	Calculated from the semester-by-semester mandatory-course list in the updated UPPE structure.
Elective (planned selection)	54	Semester 5: 15 CU; semester 6: 15 CU; semester 7: 12 CU; semester 8: 12 CU. The offered elective pool is larger.
Total planned allocation	167	Illustrative full eight-semester study-plan workload (265.53 ECTS); the minimum graduation requirement remains 144 CU (228.96 ECTS).

Rule of institution

Minimum graduation requirement: 144 CU (228.96 ECTS), subject to completing all applicable compulsory courses and programme learning requirements.

Compulsory course allocation in the updated detailed eight-semester plan: 113 CU (179.67 ECTS). This is a plan subtotal, not a new graduation threshold, and differs from the submitted SAR and the 2024 R8 totals.

Selected elective course allocation in the updated detailed eight-semester plan: 54 CU (87.45 ECTS), distributed as semester 5 = 15 CU; semester 6 = 16 CU; semester 7 = 12 CU; and semester 8 = 12 CU. Offered elective credits are larger than the selected credits, and individual courses must not be counted twice.

Total of the updated illustrative semester-by-semester plan = 167 CU (230.55 ECTS); minimum CU required for graduation = 144 CU (228.96 ECTS). Students are not obliged to enrol in every available or maximum-listed elective, and only approved courses relevant to the curriculum and prerequisites count towards graduation.

The detailed spreadsheet reflects changes in semester course placement compared with the R8 and earlier Curriculum Summary (including Semester 4 and the arrangements in Semesters 5–7). It is a revised working proposal requiring verification and formal approval. Course-code conflicts and any differences with the submitted SAR must be reconciled before online publication.

4. Mapping of the courses that support PLOs of UPPE

Table 9. The mapping of curriculum content into PLO

No	KODE	Course Name	CU	PLO								
				Social competences				Special competences				
				ATD1	ATD2	GS1	GS2	KNO1	KNO2	KNO3	SS1	SS2
1	1000002003	Indonesian	2	√		√						
2	1000002018	Pancasila	2	√			√					
3	1000002047	Physical Education and Fitness	2		√		√					
4	8420302030	General Biology	3	√		√	√		√			
5	8420304294	Basic Mechanics and Thermodynamics	4			√		√	√			
6	8420303106	General Chemistry	3			√			√			
7	8420303291	Calculus for Physics	3		√	√			√			
8	8420302188	Physical Measurement System	2			√		√				√
9	8420302275	Basic of Education	2	√	√	√	√			√		
10	842030223x	Religious Education	2	√			√					
11	1000002033	Civics	2	√			√					
12	8420302107	Conservation of Natural Resources and Environment	2		√	√	√					
13	8420304295	Basic Electromagnetism and Optics	4			√		√	√			
14	8420304292	Series and Linear Algebra for Physics	3		√	√			√			
15	8420303279	English for Physics	3			√	√	√		√		√
16	1000002046	Digital Literacy	2	√	√	√	√			√		√
17	8420302236	Learning Theories	2				√			√		
18	8420304130	Mechanics	4			√	√	√	√			
19	8420304293	Special Functions for Physics	3		√	√			√			
20	8420303296	Electronic Circuits	3			√		√	√			
21	8420302250	School Curriculum	2			√				√	√	
22	8420302283	Learning Plan	2			√				√	√	
23	8420303077	Schools Physics	3			√	√				√	
24	8420303218	Thermodynamics	3		√	√		√	√			
25	8420302197	Statistics	2		√	√	√				√	
26	8420303115	Electricity and Magnetism	3		√	√		√	√			
27	8420302240	Evaluation of Study and Learning	2		√	√	√			√		
28	8420303297	Electronica	3			√		√	√			
29	8420303069	Quantum Physics	3		√	√		√	√			
30	8420303135	Research Methodology	3			√				√	√	
31	8420303078	Statistical Physics	3			√		√		√		
32	8420302287	Learning Media	2			√				√		√
33	8420303081	Waves	3			√		√	√			
34	8420302288	Teaching Skill and Micro Learning	2			√	√			√		
35	8420303076	Modern Physics	3		√	√		√	√			
36	8420303080	Solid Physics	3			√		√		√		

No	KODE	Course Name	CU	PLO								
				Social competences				Special competences				
				ATD1	ATD2	GS1	GS2	KNO1	KNO2	KNO3	SS1	SS2
37	8420302144	Optics	2			√		√	√			
38	8420302224	Entrepreneurship	2		√	√	√					
39	8420302099	Earth and Space Science	2			√	√	√	√	√		√
40	8420303068	Nuclear Physics	3				√	√	√			
41	MBKM0032	PLP Program Planning	2	√	√	√	√					
42	1000020154	PLP Program Evaluation	2	√	√	√	√			√		
43	1000002104	Final Project Proposal	2	√	√	√	√			√		
44	1000002105	Final Project	4	√	√	√	√	√	√	√	√	√
45	8420302243	Philosophy of Sciences*	2	√		√		√			√	
46	8420302254	Physics Local Wisdom*	2	√		√		√			√	
47	8420302268	Physics Argumentation*	2	√		√		√			√	
48	8420302183	History of Physics*	2	√		√		√			√	
49	8420302245	Physics Literacy*	2	√		√		√			√	
50	8420302098	Integrated Science*	2			√	√			√		√
51	8420302265	STEAM Learning*	2			√	√			√		√
52	8420302253	Physics e-learning*	2			√	√			√		√
53	8420302269	Physics Edutainment*	2			√	√			√		√
54	8420302253	21st Century Physics Learning*	2			√	√			√		√
55	8420302316	Standard Assessment Study*	2			√	√			√		√
56	8420302263	Olympiad of Physics*	2			√	√			√		√
57	8420302264	Measurement and Instruments of Physics Education*	2			√	√			√		√
58	8420302260	Item Response Theory*	2			√	√			√		√
59	8420302270	Digital Based Assessment*	2			√	√			√		√
60	8420302259	Physics Communication and Media Analysis*	2			√				√	√	√
61	8420302252	Audiovisual Physics*	2			√				√	√	√
62	8420302246	Physics of Photography*	2			√				√	√	√
63	8420302143	Multimedia*	2			√				√	√	√
64	8420302108	Physics Laboratory*	2			√				√	√	√
65	8420302052	Renewable Energy*	2				√	√	√			
66	8420302079	Applied Physics*	2				√	√	√			
67	8420302063	Earth Science*	2				√	√	√			
68	8420302261	Earth Disaster Mitigation*	2				√	√	√			
69	8420302266	Robotics Physics*	2				√	√	√			
70	8420302061	Space Physics*	2				√	√	√			
71	8420306276	Innovative Learning**	3		√	√				√		
72	8420303313	Application of Physics Learning Media**	3		√	√				√		
73	8420303312	Development of Physics Teaching Materials**	3		√	√				√		
74	8420303315	Physics Learning Assessment**	3		√	√				√		
75	8420304314	Physics Teaching Practice**	4		√	√				√		

No	KODE	Course Name	CU	PLO								
				Social competences				Special competences				
				ATD1	ATD2	GS1	GS2	KNO1	KNO2	KNO3	SS1	SS2
76	8420303301	School Physics Curriculum Analysis***	3	√		√	√			√		
77	8420304307	Applications of Statistics in Physics Education***	4	√		√	√			√		
78	1000020158	Critical and Creative Thinking***	2	√		√	√			√		
79	1000020163	Communication Skills***	2	√		√	√			√		
80	8420304309	Community Physics***	4	√		√	√			√		
81	1000020164	International Conference***	3	√		√	√			√		
82	8420303305	Selected Topics in Physics Education***	3	√		√	√			√		
83	1000020165	National Conference***	2	√		√	√			√		
84	8420303302	Observation of School Physics Assessment***	3	√		√	√			√		
85	8420303304	Observation of School Physics Learning Media***	3	√		√	√			√		
86	8420303303	Observation of Innovative School Physics Learning***	3	√		√	√			√		
87	8420304310	Physics Reasoning***	3	√		√	√			√		
88	8420303306	Sustainable Physics Education***	3	√		√	√			√		
89	8420302311	Entrepreneurship Practice***	2	√		√	√			√		
90	8420302308	Socio-Scientific Issues (SSI) in Society***	2	√		√	√			√		

Note: *UPPE Elective Courses; **Courses of Introduction to School Program (PLP); * Elective Courses of Academic Mobility Program (AMP).**

- 1 According to UNESA Rector Decree No. 736/HK/KM/2023 as cited in the submitted SAR, 1 CU corresponds to 170 minutes per week over 16 weeks (approximately 45.33 workhours per semester). Course-specific workload, including self-study, laboratory work, internship and thesis activity, must be documented in the relevant module description.
- 2 The CU-to-ECTS conversion used consistently in this document is 1 CU = 1.59 ECTS, as specified in the submitted SAR. Values displayed in the curriculum tables are calculated as CU × 1.59.

5. Elective courses

Table 8. Elective Course of the UPPE

No.	Code	Elective course (as listed)	CU	ECTS
1	8420302243	Philosophy of Sciences*	2	3.18
2	8420302254	Physics Local Wisdom*	2	3.18
3	8420302268	Physics Argumentation*	2	3.18
4	8420302183	History of Physics*	2	3.18
5	8420302245	Physics Literacy*	2	3.18
6	8420302098	Integrated Science*	2	3.18
7	8420302265	STEAM Learning*	2	3.18
8	8420302253	Physics e-learning*	2	3.18
9	8420302269	Physics Edutainment*	2	3.18
10	8420302253	21st Century Physics Learning*	2	3.18
11	8420302316	Standard Assessment Study*	2	3.18
12	8420302263	Olympic Physics*	2	3.18
13	8420302264	Measurement and Instruments of Physics Education*	2	3.18
14	8420302260	Item Response Theory*	2	3.18
15	8420302270	Digital Based Assessment*	2	3.18
16	8420302259	Physics Communication and Media Analysis*	2	3.18
17	8420302252	Audiovisual Physics*	2	3.18
18	8420302246	Physics of Photography*	2	3.18
19	8420302143	Multimedia*	2	3.18
20	8420302108	Physics Laboratory*	2	3.18
21	8420302052	Renewable Energy*	2	3.18
22	8420302079	Applied Physics*	2	3.18
23	8420302063	Earth Science*	2	3.18
24	8420302261	Earth Disaster Mitigation*	2	3.18
25	8420302266	Robotics Physics*	2	3.18
26	8420302061	Space Physics*	2	3.18
27	8420306276	Innovative Learning**	3	4.77
28	8420303313	Application of Physics Learning Media**	3	4.77
29	8420303312	Development of Physics Teaching Materials**	3	4.77
30	8420303315	Physics Learning Assessment**	3	4.77
31	8420304314	Physics Teaching Practice**	4	6.36
32	8420303301	School Physics Curriculum Analysis***	3	4.77
33	8420304307	Applications of Statistics in Physics Education***	4	6.36
34	1000020158	Critical and Creative Thinking***	2	3.18
35	1000020163	Communication Skills***	2	3.18
36	8420304309	Community Physics***	4	6.36
37	1000020164	International Conference***	3	4.77
38	8420303305	Selected Topics in Physics Education***	3	4.77
39	1000020165	National Conference***	2	3.18
40	8420303302	Observation of School Physics Assessment***	3	4.77
41	8420303304	Observation of School Physics Learning Media***	3	4.77
42	8420303303	Observation of Innovative School Physics Learning***	3	4.77
43	8420304310	Physics Reasoning***	3	4.77
44	8420303306	Sustainable Physics Education***	3	4.77
45	8420302311	Entrepreneurship Practice***	2	3.18
46	8420302308	Socio-Scientific Issues (SSI) in Society***	2	3.18
		TOTAL AVAILABLE LISTED ELECTIVE POOL (46 courses)	**110**	**174.90**