ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes
Biology
Chemistry
Mathematics
Physics

Provided by
Universitas Negeri Surabaya, Indonesia

Version: 23 June 2023

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[2]
Program Studi Biologi	Undergraduate programme in Biology	ASIIN	BAN-PT: A, 2020 - 2025	10
Program Studi Kimia	Undergraduate programme in Chemistry	ASIIN	BAN-PT: A, 2020 - 2025	09
Program Studi Matematika	Undergraduate programme in Mathematics	ASIIN	BAN-PT: A, 2017 - 2022	12
Program Studi Fisika	Undergraduate programme in Physics	ASIIN	BAN-PT: A, 2020 - 2025	13
Date of the contract:.29.10.2022 **Submission of the final version of the self-assessment report:** 31.01.2022 **Date of the audit (online):** 22.03. – 24.03.2022				
Peer panel: Prof. Dr. Marc Brecht, University of Applied Sciences Reutlingen Prof. Dr. Claudia Cottin, University of Applied Sciences Bielefeld Prof. Dr. Uwe Strotmann, Westphalian University of Applied Sciences Prof. Dr. Marco Thines, University of Frankfurt Istiffa Nurfauziah, Novartis Indonesia Felix Cahyadi, student, Institut Teknologi Bandung, Indonesia				

[1] ASIIN Seal for degree programmes;

[2] TC: Technical Committee for the following subject areas: TC 09 – Chemistry; TC 10 – Life Sciences; TC 12 – Mathematics; TC 13 – Physics

Representative of the ASIIN headquarter: Rainer Arnold	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of 15.05.2015 ASIIN General Criteria as of 28.03.2014 Subject-Specific Criteria of Technical Committee 09 – Chemistry as of 29.03.2019 Subject-Specific Criteria of Technical Committee 10 – Life Sciences as of 28.06.2019 Subject-Specific Criteria of Technical Committee 12 – Mathematics as of 09.12.2016 Subject-Specific Criteria of Technical Committee 13 – Physics as of 20.03.2020	

B Characteristics of the Degree Programmes

a) Name	Final degree (original)	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Undergraduate programme in Biology	Sarjana Sains Biologi / Bachelor of Science in Biology	-	6	Full time	no	8 Semester	144 CU / 228.96 ECTS	1998, August
Undergraduate programme in Chemistry	Sarjana Sains Kimia / Bachelor of Science in Chemistry	-	6	Full time	no	8 Semester	144 CU / 228.96 ECTS	1998, August
Undergraduate programme in Mathematics	Sarjana Sains Matematika / Bachelor of Science in Mathematics		6	Full time	no	8 Semester	144 CU / 228.96 ECTS	1998, August
Undergraduate programme in Physics	Sarjana Sains Fisika / Bachelor of Science in Physics		6	Full time	no	8 Semester	144 CU / 228.96 ECTS	1998, August

[3] EQF = The European Qualifications Framework for lifelong learning

For the Bachelor's degree programme Biology (UPB), Universitas Negeri Surabaya (UNESA) has presented the following profile in the Self-Assessment Report:

"The purpose of the Biology study programme was developed to produce graduates who have competencies as Professionals in Academic, Researcher Assistant, Practitioner, and entrepreneurs in Biology who are able to compete at global level.

The Programme Educational Objectives (PEO) of UPB are the following:

1. Mastery of basic concepts of biology, natural resources, and environment and ability to apply them to solve various biological issues in professional work;

2. Ability to manage natural resources and environment, and develop biological products according to strengthen bioecopreneurship;

3. Mastery over scientific method to analyse biological issues and its application, work systematically and methodically;

4. Have ethics, responsibility, leadership, and environmental insight;

5. Ability to develop self in biological intelligence and skills both formally and informally, and communicate in professional activity."

For the Bachelor's degree programme Chemistry (UPC), Universitas Negeri Surabaya (UNESA) has presented the following profile in the Self-Assessment Report:

"The Chemistry graduates are prepared to achieve Programme Educational Objectives (PEO) that is to have accomplishment in their early career as a practitioner; research assistant; and entrepreneur who have basic knowledge of chemical concepts and instrumentation, exhibit laboratory technical skills to solve chemistry problem and demonstrate self-development in a sustainable manner, as well as work in the field of green-technopreneurship.

Details of the PEO for Graduates of the undergraduate programme of Chemistry are as follows:

1. Able to master the fundamental knowledge of chemistry, the basic principles of chemical instruments, laboratory organizations, Occupational Health and Safety, scientific methods, digital literacy to solve a problem in their profession/workplace (professional).

2. Able to improve higher-order thinking skills by analysing, evaluating data, and being creative; communicating ideas, able to take the right initiatives, be good decision-makers, and can lead in relevant field workgroups.

3. Able to develop and apply chemistry concepts along with the progress of science and technology as well as humanities values.

4. Able to demonstrate good communication in a collaborative work, honest, and be responsible for his expertise in the field of chemistry and have an eco-entrepreneurial character (ecopreneurship)

5. Able to develop themselves and always update the development of chemistry, as well as lifelong learning through formal or non-formal education."

For the Bachelor's degree programme Mathematics (UPM), Universitas Negeri Surabaya (UNESA) has presented the following profile in the Self-Assessment Report:

"The programme focuses its objectives to produce graduates who can become professionals in the field of mathematics who have the characteristics of PEO (Programme Educational Objectives) as provided below.

1. Able to master mathematics conceptually and able to use it in order to make decisions and to solve problems based on procedural, structured data and fact analysis. (PEO-1) (Academic Accomplishment)

2. Able to work not only independently and collaboratively, with high integrity and work ethic, but also to continue improving themselves. (PEO-2) (Academic Accomplishment)

3. Able to bring change and improvement for ecopreneurship-based communities. (PEO-3) (General or Social Accomplishment)

4. Able to apply mathematical science and take advantage of technological advances in the field they are involved in, as well as make a real contribution in solving problems in any workplace. (PEO-4) (General or Social Accomplishment)."

For the Bachelor's degree programme Physics (UPP), Universitas Negeri Surabaya (UNESA) has presented the following profile in the Self-Assessment Report:

"UPP focuses on producing graduate who can become professionals in academics, assistant of researcher, practitioner, and entrepreneur (professional accomplishment) who have the following objectives.

1. Produce Bachelor of Physics who are able to use physics knowledge and methodology to solve problems in their work field (PEO-1).

2. Produce Bachelor of Physics who have a strong commitment to developing knowledge, whether by studying in a higher-level degree working in a formal institution and entrepreneurs (PEO-2).

3. Produce Bachelor of Physics who master the scientific method to observe, analyse and understand physical phenomena, and produce scientific work and contribute according to their expertise (PEO-3).

4. Produce Bachelor of Physics who masteries physics that is able to apply their knowledge, expertise in various fields of work, and develop themselves in their career environment (PEO-4).

5. Produce Bachelor of Physics who can communicate orally and/ in writing effectively, creatively, innovatively, and collaboratively, as well as working in teams (PEO-5)."

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Webpage Ba Biology: https://s1-biologi.fmipa.unesa.ac.id/
- Webpage Ba Chemistry: https://s1-kimia.fmipa.unesa.ac.id/
- Webpage Ba Mathematics: https://s1-matematika.fmipa.unesa.ac.id/
- Webpage Ba Physics: https://s1-fisika.fmipa.unesa.ac.id/
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The peers base their assessment of the learning outcomes as provided on the websites and in the Self-Assessment Report of the four Bachelor's degree programmes under review.

For all four undergraduate programmes, Universitas Negeri Surabaya (UNESA) has described and published Programme Educational Objectives (PEO) and Programme Learning Outcomes (PLO). While the PEO are rather general and refer to the vision and mission of the Faculty of Mathematics and Natural Sciences (FNMS), the PLO cover several specific competences students should acquire in their respective degree programme. Both PEO and PLO of each degree programme are published on the programme's website.

The peers refer to the Subject-Specific Criteria (SSC) of the Technical Committee Life Sciences as a basis for judging whether the intended learning outcomes of the Bachelor's degree programme Biology, as defined by UNESA, correspond with the competences as outlined by the SSC. They come to the following conclusions:

Graduates of the Bachelor's degree programme Biology (UPB) should understand the basic biological processes and be capable of applying the scientific methods of the biological sciences. In addition, graduates should acquire relevant scientific knowledge in the different biological areas such as botany, zoology, biotechnology, microbiology, molecular biology, cell biology, and related natural sciences (chemistry, physics). Furthermore, the students should be able to design, perform, and assess independent laboratory experiment and fieldwork in biology. Moreover, students should learn how to collect, analyse, and interpret data to solve biological issues. Finally, students should be qualified to conduct long-life learning and work effectively, both individually and in a team, and to demonstrate a scientific, critical, and innovative attitude in biology learnings, laboratory works, and environmental care.

UPB is designed as a general biology programme with some specialization options for the student's final research project. The programme educational objectives and learning outcomes are expected to equip the graduates with life skills required to develop and adapt to the wide spectrum of possible occupations. Biology graduates have various occupational opportunities, which include working as a researcher, teacher/lecturer, entrepreneur, and they can find suitable jobs in industry, academia, or public institutions.

Based on the results of the tracer study, UPB alumni mainly work as professionals in academics (52 %), practitioners (32 %), entrepreneurs (11 %), and researcher assistants (6 %). Graduates who work as academician have corresponding jobs in academics, such as lecturers or laboratory staff at universities and schools, and tutors in tutoring institutions. Graduates who work as practitioners have jobs such as quality control analysts, or company, office, and banking staff.

The peers refer to the Subject-Specific Criteria (SSC) of the Technical Committee Chemistry, Pharmacy as a basis for judging whether the intended learning outcomes of the Bachelor's degree programme Chemistry (UPC), as defined by UNESA, correspond with the competences as outlined by the SSC. They come to the following conclusions:

UPC graduates should acquire a basic knowledge of natural sciences and gain methodological and scientific competences in the chemical sciences (analytical chemistry, organic chemistry, inorganic chemistry, physical chemistry, and biochemistry) in order to learn about the structure, dynamics, and energy, as well as the basic principles of separation, analysis, synthesis, and characterization of chemicals. Furthermore, graduates should also be able to carry out practical work in laboratories and to design and perform experiments. They also should be familiar with modern experimental methods of chemistry, the safe handling of chemicals, have a sound knowledge of safety and environmental issues and the

underlying legal framework, and be able to interpret, critically assess, present, and communicate relevant information and new research results, and to discuss them with specialist colleagues. Moreover, the graduates should be capable of using the acquired knowledge and skills to find solutions to practical chemical problems and for conducting scientific work. Finally, they should be familiar with chemical hazards and problems that are relevant for the community and be able to apply appropriate means to solve these problems, in order to improve the quality of people's lives.

Graduates of the chemistry programme have several job opportunities. The majority of chemistry graduates work in sectors such as chemical and pharmaceutical industry, petrochemical and gas companies, mining and polymer industries, environmental research and monitoring institutions, public agencies, and educational institutions by becoming teachers or lecturers. The alumni tracer study shows that UPC alumni are mainly employed either as practitioner (67 %) or as research assistants (17 %).

UPM graduates should acquire a profound knowledge of mathematics and gain methodological competences in the mathematical sciences. Students should develop a mathematical, logical, and rigorous reasoning. In addition, they should be familiar with different fundamental areas of mathematics (like linear algebra, discrete mathematics, mathematical computation and simulation, multivariable calculus, data analysis, and differential equations). Finally, graduates should have a thorough understanding of the underlying mathematical concepts. This should enable them to develop critical thinking skills and the ability to use mathematical concepts to solve real life problems.

UPM graduates usually follow two distinct careers: some work in academia or higher education as math researchers or teachers, while others work in private companies. Job opportunities in the industry are manifold: some graduates have an interest in information technology and work as computer programmers, software developers, or data scientists. Others may take jobs in the financial sector and work as consultants or financial analysts. Some graduates pursue further degrees (Master or PhD) in mathematics or other scientific fields.

The intended learning outcomes of the Bachelor's degree programme Physics (UPP) focus on conveying scientific methods for observing, understanding, analysing, and solving physical phenomena and problems. This includes that graduates should also acquire fundamental knowledge of mathematics, computer sciences, and natural sciences relevant to physics. Furthermore, graduates need to know how to conduct and prepare experiments, including the application of scientific methods. In addition, graduates should be capable to apply and evaluate modern methods and instruments of studying and teaching physics by using information and communication technology.

UPP graduates have numerous job opportunities, because they are not restricted to a specific area, but overall well prepared for a science and technology oriented job market. As a result, UPP graduates work in various sectors such as universities, research institutes, public and private agencies, information & communication companies, or high schools. Some open their own private business and others work in areas such as banking, insurance, retail, or other services. The alumni tracer study shows that the UPP alumni are employed as practitioners (54 %), research assistants (3 %), and professional academics (materials physics, earth and computational physics, instrumentation physics, and optics, 44 %).

Supplementing the subject-related qualification objectives, students of all four Bachelor's programmes should have adequate competences in oral and written communication skills, be capable of working autonomously as well as in a group, and be able to conduct research activities. Furthermore, they should have trained their analytical and logical abilities and should acquire communicative and language skills as well as develop a strategy for life-long learning.

The peers gain the impression that the graduates of all degree programmes under review are well prepared for entering the labour market and can find adequate jobs in Indonesia. Most of the Bachelor's graduates enter the job market directly, only few (approximately 10 %) continue with a Master's degree either at UNESA or at other universities. On average, it takes graduates three to six months to find a suitable job after graduation.

In summary, the peers are convinced that the intended qualification profiles of the four undergraduate programmes under review allow students to take up an occupation, which corresponds to their qualification. The degree programmes are designed in such a way that they meet the goals set for them.

The peers conclude that the objectives and intended learning outcomes of the degree programmes adequately reflect the intended level of academic qualification and correspond sufficiently with the ASIIN Subject-Specific-Criteria (SSC) of the respective Technical Committees.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report

Preliminary assessment and analysis of the peers:
UNESA awards a Bachelor of Science (B.Sc.) or Sarjana Sains (S.Si.) degree to the graduates of the four undergraduate programmes.

The peers confirm that the names of all four Bachelor's degree programmes appropriately reflect the focus and content of the respective programme. Moreover, the English translation and the original Indonesian names of UPC, UPB, UPP, and UPM correspond with the intended aims and learning outcomes as well as the main course language (Bahasa Indonesia).

Criterion 1.3 Curriculum

Evidence:

- Study plans of the degree programmes
- Module descriptions
- UNESA Academic Guidelines
- Webpage Ba Biology: https://s1-biologi.fmipa.unesa.ac.id/
- Webpage Ba Chemistry: https://s1-kimia.fmipa.unesa.ac.id/
- Webpage Ba Mathematics: https://s1-matematika.fmipa.unesa.ac.id/
- Webpage Ba Physics: https://s1-fisika.fmipa.unesa.ac.id/
- Discussions during the audit

Preliminary assessment and analysis of the peers:
All four undergraduate programmes are offered by the Faculty of Mathematics and Natural Sciences (FMNS) of Universitas Negeri Surabaya (UNESA).

The Bachelor's degree programmes under review are designed for four years and are offered as full time programmes. In all four programmes, 144 credit semester units (CU) need to be achieved by the students (this is equivalent to 228.96 ECTS points).

All undergraduate programmes at UNESA are designed to be completed in eight semesters or four academic years with a maximum of 14 semesters or seven academic years. Each semester is equivalent to 14 weeks of learning activities. Besides these learning activities, there is one week for midterm exams and one week for final exams. The odd semester starts in August and ends January of the following year, while the even semester lasts from February to July.

A short summer semester (intermediate semester) is offered with a maximum workload of nine credit units. The summer semester is designed to assist students to repeat failed classes or to make up for missing credits in order to be able to complete the programme within the allowed time period.

The curriculum consists of university requirements and compulsory and elective courses determined by the Faculty of Mathematics and Natural Sciences and the respective departments. University requirements are courses that need to be attended by all undergraduate students at UNESA. There are nine university requirements with 18 CU: Pancasila, Religion, Bahasa Indonesia, Citizenship Education, Physical Education, Entrepreneurship, Digital Literacy, Conservation of Natural Resources and Environment, and Social and Cultural Studies. These courses are almost all offered in the first two semesters of studies, in addition to courses conveying basic knowledge of natural sciences and mathematics.

Courses on the different subject-specific topics are offered from third to eighth semester. Elective courses can be taken from the third year of study. Students usually choose elective courses that relate to their thesis and/or their individual interests. During the eight semesters, students must also complete the undergraduate thesis (6 CU), the community service (3 CU), and the internship (3 CU).

Usually during the last year of studies, students must complete the community service. The peers discuss with the programme coordinators about the content and goal of this course. The programme coordinators explain that community service is compulsory for all Indonesian students. It has a minimum length of eight weeks and often takes place in villages or rural areas where students stay and live together with the local people. The course is designed "to allow students to apply their knowledge based on their field in order to empower society." Since the community service usually takes place in remote areas, the students cannot attend any classes during this time. The students work in interdisciplinary teams during the community service in order to advance the society and bring further development about. This course was introduced at all Indonesian Universities in 1971. The assessment of the community service consists of a work plan, programme implementation, and activity report. The peers understand that students should work for the benefit of the community and the Indonesian society during the community service and support this concept.

A compulsory internship is part of the undergraduate curriculum. Internships are usually carried out in various institutions or companies that are relevant to the specified scientific field. Students should learn about tasks and problems that exist in the professional world according to their field of competence and are expected to develop their professional abilities and soft skills. In addition, they can establish a relationship with their host institution or company, which creates additional job opportunities. During the internship, students are divided into small groups of students of about two or three people. A teacher from UNESA and a practitioner from the host institution/company supervise each group. Students have to write and present a report about their experiences in front of their supervisor and other students.

With respect to the Bachelor's thesis, the peers point out that students need to be introduced to scientific writing and learn how to prepare publications, how to cite scientific sources, and how use figures and diagrams. The peers see that the provided sample theses are somewhat deficient in these areas (see criterion 3).

Since UNESA has the goal to become internationally more visible and wants to further internationalise its degree programmes, the peers discuss with the programme coordinators and students if any classes at FMNS are taught in English. The programme coordinators explain that there is an "excellence class" in each of the four undergraduate programmes, which is completely taught in English. Students can apply for entering the excellence class and are selected in the second semester based on GPA and English proficiency. Usually, there are 25 places in the excellence class in each study programme. The excellence classes were just recently established in 2021. In UPM, there are three students from Malaysia; in the other programmes, there are no international students. The peers appreciate the existence of an English taught class, which helps students to find jobs in international companies and improves their opportunities to join international Master's programmes.

In the "regular classes" all courses are delivered in Bahasa Indonesia (Indonesian language), however part of the teaching materials and most of the textbooks are provided in English. Information about the curriculum is available for students in the digital academic information system and on the programme's homepage. Furthermore, students are encouraged to attend summer courses that are held in English with international students and guest lecturers. Nevertheless, the active English speaking skills of the students in the regular classes should be further improved. This could, for example, be done by conducting presentations in English or by discussing current scientific publications.

The peers see that many members of the teaching staff in the Faculty of Mathematics and Natural Sciences have international experience or contacts (e.g., have graduated from an international university and/or collaborate with colleagues from abroad). This is a good starting point for establishing more international co-operations in order to further promoting the students' academic mobility (see criterion 2.1).

The members of the teaching staff explain on demand of the peers that they offer possible topics for the final projects according to their own research projects. All members of the teaching staff supervise theses. Students have to design a research proposal (this proposal is developed in the "seminary course", which usually takes place in the seventh semester) with a time schedule for the project, which is discussed with the academic advisor. If they agree, the students apply formally for being allowed to work on the suggested topic.

The peers gain the impression that the graduates of all degree programmes under review are well prepared for entering the labour market and can find adequate jobs in Indonesia.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report
- UNESA Academic Guidelines
- Decree of Minister of Research, Technology and Higher Education No. 2, 2015
- UNESA webpage: https://www.unesa.ac.id/
- Discussions during the audit

Preliminary assessment and analysis of the peers:
According to the Self-Assessment Report, admission procedures and policies for new students follow the National Regulation No.2, 2015. The requirements, schedule, registration venue, and selection test are announced on UNESA's webpage, and thus accessible for all stakeholders.

There are three different ways by which students can be admitted to a Bachelor's programme at UNESA:

1. National Entrance Selection of State Universities (Seleksi Nasional Masuk Perguruan Tinggi Negeri, SNMPTN), a national admission system, which is based on the academic performance during high school (25 % of the students at UNESA are admitted through this selection system).

2. Joint Entrance Selection of State Universities (Seleksi Bersama Masuk Perguruan Tinggi Negeri, SBMPTN). This national selection test is held every year for university candidates. It is a nationwide online test (subjects: mathematics, Bahasa Indonesia, English, physics, chemistry, biology, economics, history, sociology, and geography). It accounts for 45 % of the admitted students at UNESA.

3. New Student Admission Selection (Seleksi Penerimaan Mahasiswa Baru, SPMB). Students are selected based on an online test (similar to SBMPTN) specifically held by UNESA for prospective students that haven not been accepted through SNMPTN or SBMPTN. SPMB is carried out twice per year. First after the results from SNMPTN, and the second time after the announcement of the SBMPTN results. (30 % of the students at UNESA are admitted through this test.)

Based on the number of lecturers, the condition of the facilities and the infrastructure, the senate of FMNS decides the number of intakes, which is subsequently proposed to the university. In recent years, intake numbers for the undergraduate programmes have been constant at 70 students.

The number of applicants exceeds by far the number of available places. For example, within the last three years, an average of 950 students applied for admission to UPB, which is equivalent to an admission rate of only 7.4 %. In the other programmes, the numbers are similar: Within the last three years, an average of 670 students applied for admission to UPC (admission rate of 10.4 %), an average of 480 students applied for admission to UPP (admission rate of 14.6 %), and an average of 884 students applied for admission to UPM (admission rate of 7.9 %). However, the number of applications has decreased in the last two years due to the Covid pandemic. It is expected that the number will rise again after the end of the pandemic.

Undergraduate students at UNESA have to pay tuition fees. However, a tuition waiver scheme is available upon request and the amount depends on the parents' economic status. In addition, several grants for students with financial difficulties are available, such as from the government, industries, foundations, and UNESA alumni association. Some senior students work as laboratory assistants to earn some money for helping to finance their studies.

The details of the application process at UNESA and further information on admissions criteria and deadlines can be found in the National Regulation No. 2, 2015, and the UNESA Academic Guidelines, which are also published on the university's webpage.

From their discussion with the students, the peers gain the impression that the admission system is very effective and only very motivated and high-performing candidates are admitted. The peers consider the highly selected and motivated students to be one of the strong points of the four undergraduate programmes under review.

In summary, the peers find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes. However, the peers learn that applicants with colour-blindness are not admitted to UPB, UPC, and UPP. They are aware that this is common practice at Indonesian universities, but are convinced that it is unnecessary, because experiments are conducted in groups and the colour-blindness of one student can be easily compensated by the other group members. Hence, they consider such an admission criterion too restrictive and expect UNESA to change it (see also criterion 5.3).

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

The peers are glad to hear that students in the regular classes of all four undergraduate programmes are encouraged to further improving their English proficiency through academic and non-academic activities (e.g. attending summer courses that are held in English with international students and guest lecturers). Nevertheless, the peers are convinced that there is still some room for improvement with respect to the students' English proficiency.

The peers are satisfied that from 2022, new student admissions no longer excludes colour-blind persons so that they can enrol in all study programmes at FMNS.

The peers consider criterion 1 to be mostly fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Webpage Ba Biology: https://s1-biologi.fmipa.unesa.ac.id/
- Webpage Ba Chemistry: https://s1-kimia.fmipa.unesa.ac.id/
- Webpage Ba Mathematics: https://s1-matematika.fmipa.unesa.ac.id/
- Webpage Ba Physics: https://s1-fisika.fmipa.unesa.ac.id/
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The curriculum of all four Bachelor's degree programmes under review are designed for eight semesters. Nevertheless, it is also possible for excellent students to complete the degree in only seven semesters. Students cannot cover more than 24 CU per semester. All

students have to complete the undergraduate programme within seven years. The students' individual study plans are different from each other, and have to be approved by their academic advisors.

A systematic university-wide review of the curriculum is conducted every four years, but minor changes may be implemented every year after endorsement by the FMNS senate.

The curriculum in the first two semesters is very similar for all four undergraduate programmes. Courses in the first two semesters convey basic knowledge of natural sciences, mathematics, and languages (Indonesian and English). In addition, students need to attend obligatory courses, such as Religion Education, Indonesian, Citizenship Education, Social and Cultural Sciences, and Digital Literacy, which are university requirements and need to be attended by all students at UNESA. From the third semester on, more subject-specific classes are offered, with a focus on the respective science area (biology, chemistry, mathematics, and physics). During the seventh and eighth semester, students must complete the Community Service, the internship, and the undergraduate thesis. Several of the courses, especially in UPB, UPC, and UPP include practical laboratory work, which should enable students to design and carry out experiments, to collect and analyse data, and to present the results both orally and in writing.

In the Bachelor's degree programme Biology, students are required to complete 144 credit units (CU), which equivalent to 228.96 ECTS, including 122 CU of compulsory courses and 22 CU of elective courses. In UPB, the subject-specific courses are grouped in six areas:

(1) Cell and Molecular Biology that studies the organization of living things at the cellular and sub-cellular level,

(2) Physiology studies of the processes that occur in living things systems,

(3) Genetics that studies the substance of genes and its inheritance processes to ensure the survival of living body systems,

(4) Structure and Development that studies individual-level organizations and ontogenetic changes in the organization,

(5) Biosystematics and Evolution that studies the diversity of living things and their phylogenetic history, and

(6) Ecology studies the organization of individual interactions with respect to population, community, ecosystem, and to the biosphere.

The Bachelor's degree programme Chemistry requires students to complete 124 CU of compulsory courses and a minimum of 20 CU of elective courses. Students choose the electives based on their personal interests from a list of 24 courses..

In order to complete the Bachelor's degree programme Mathematics, students need to take 144 credit units (CU) including 123 CU for compulsory modules and 21 CU for electives. The UPM curriculum includes compulsory courses such as mathematical analysis, algebra, applied mathematics, computational mathematics, combinatorics, geometry, and topology. In addition, students can choose their electives from a list of 31 modules.

The Bachelor's degree programme Physics requires 144 CU consisting of 120 CU for compulsory courses and 24 CU for electives. The elective courses in UPP focus on three different areas: 1) Material Physics, 2) Earth Physics, and 3) Instrumentation and Optical Physics.

After analysing the module descriptions and the study plans, the peers confirm that all degree programmes under review are divided into courses. All practical lab work and internships are well integrated into the curriculum, and the supervision by FMNS guarantees for their respective quality in terms of relevance, content, and structure.

However, the peers point out that there is a large number of small modules in each degree programme which increases the exam load of the students. For example, in UPC the courses "Thermodynamics of Chemistry" and "Chemical Kinetics" could be part of a module "Physical Chemistry", the same applies to courses that could belong to modules called "Inorganic Chemistry" or "Organic Chemistry". There are similar examples in UPB and UPP. For this reason, it would be useful to revise the curricular structure by combining related courses to larger modules. A coherent curriculum is useful in order to make clear how the courses build on each other. Combining small courses to larger modules helps to provide a better structure to the curriculum.

There is a similar issue with respect to the electives. First, it would be useful to increase the number of electives and, secondly, it is recommended to group the electives according to their scientific focus. This would help students to select suitable electives so that they have a better orientation and can develop their personal scientific profile. Students at UNESA can choose elective courses according to their individual interests and after consultation with their academic advisor.

The employers are generally satisfied with the graduates' qualification profile. During the discussion with the peers they only suggest to put more emphasis on developing the students' soft skills (mainly communication competences) and to convey more knowledge about ISO regulations.

The peers point out that UNESA should regularly adapt the curricula to technological advancements and current developments in the respective sciences (e.g., bioinformatics, genomics, analytical and computational chemistry, artificial intelligence, and data science), in order to prepare graduates even better for the requirements of the job market.

With respect to UPB, the peers point out that important subjects e.g., bioinformatics, and genomics are missing in the curriculum. In addition, several essential courses, such as virology, mycology, and bacteriology should be compulsory courses and not just electives.

In UPC, courses in modern bonding theory, modern instrumental analytical and computational chemistry should be added to the curriculum. In addition, it should be clarified how many practical courses are offered in the degree programme. This includes a clear description how many hours of practical work the students have in each course.

In UPM, the catalogue of electives is sufficient and even quite comprehensive for a Bachelor`s programme. In UPP, it would be useful offer a course in simulation of physical systems.

Finally, the peers discuss with teachers and students what programming languages are offered. They learn that FMNS introduces students to “Python” in the computational courses, an open-source software, which offers a general-purpose approach to data sciences. The peers point out, that it would also be useful to give students the opportunity to get to know other programming languages and software tools such as “MATHLAB” and ”R”. “R” is also a free programming language for statistical calculations and graphics.

In summary, the peers gain the impression that the choice of modules and the structure of the curriculum ensures that the intended learning outcomes of the respective degree programme can be achieved.

International Mobility

UNESA provides some opportunities for students to conduct internships and exchange programmes abroad. Students who take part in student exchanges through cooperation programmes can gain recognition of the acquired credits after obtaining approval from their undergraduate programme.

All four undergraduate programmes have established several collaborations with other Indonesian universities and with some international universities (e.g. Malaysia, Philippines, Japan, and Brazil). Although some international co-operations exist, the number of Indonesian students spending some time abroad is rather low. From 2020 to 2021, 32 UPM students joint international and national student mobility programmes. However, most academic mobility occurs within the country and the respective stays are rather short, e.g., for taking part in summer schools. At the same time, there were inbound students in UPM (25 from 2020 to 2021), but all of them came from other Indonesian universities. The numbers are similar for the other undergraduate programmes.

Teachers at UNESA have the opportunity to spend time abroad, either to pursue a higher academic degree, but also for attending international conferences or conducting joint research projects. UNESA and FMNS both support academic staff and student mobility. This

includes cooperating with universities abroad in credit transfer programmes, such as with Tarlac Agricultural University (Philippines).

The new policy of the Indonesian government actively supports any activities outside of the university by releasing a regulation on the Merdeka Belajar-Kampus Merdeka (MBKM), which requires the university to promote students who want to spent part of their Bachelor's programme outside UNESA (Minister of Education and Culture Regulation Number 3 Year 2020). UNESA recognizes the courses taken by the students outside UNESA, based on the comparability of the intended learning outcomes. The peers consider this regulation sufficient. However, according to the opinion of the peer group, the academic mobility of the students should be further promoted. The number of Bachelor's students who participate in international exchange programmes is still low despite students' high interest. National scholarships are available, but they are highly competitive, so only a few students receive them.

The students confirm during the discussion with the peers that some opportunities for international academic mobility exist and that the credits acquired abroad are recognised at UNESA. However, they also point out that they wish for more places and better endowed scholarships for long- and short-term stays abroad. The number of available places in the exchange programmes is still limited and there are restrictions due to a lack of sufficient financial support. UNESA can provide only limited travel grants, while the demand from students is rising. The lack of financial support hinders students from joining the outbound programmes.

The peers understand these problems; however, they recommend increasing the effort to further internationalising UNESA by establishing more international co-operations and exchange programmes, and by offering more and better-endowed scholarships. In addition, the peers see that most of the faculty members have international contacts, which can be used for establishing more international co-operations.

The peers emphasize that it is very useful for students to spend some time abroad already during their Bachelor's studies to improve their English proficiency, to get to know other educational systems, and to enhance their job opportunities. Furthermore, FMNS should invite more visiting lecturers, initiate more international exchange programmes, and provide more scholarships for students.

A good starting point for initiating international co-operations are the personal international contacts of the faculty members. It is also possible for students and teachers to apply to international organisations like ERASMUS or the German Academic Exchange Council (DAAD) for receiving funds for stays abroad.

In summary, the peers appreciate the effort to foster international mobility and support FMNS to further pursuing this path. However, the academic mobility is still low and there is room for improvement.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:
Based on the National Standards for Higher Education of Indonesia (SNPT), all four undergraduate programmes under review use a credit point system called CU.

For regular classes, 1 CU of academic load for the undergraduate programme is equivalent to 3 academic hours, which equals 170 minutes. This includes:

- 50 minutes of scheduled contact with the teaching staff in learning activities,
- 60 minutes of structured activities related to lectures, such as doing the assignments, writing papers, or literature study,
- 60 minutes of independent activities outside the class room to obtain a better understanding of the subject matters and to prepare academic assignments such as reading references.

For lab work, final project, fieldwork, and other similar activities, 1 CU is equivalent to 3 to 5 hours a week of student's activities. The details and the students' total workload are described in the respective module description.

The minimum workload of an undergraduate programme at UNESA is 144 CU, which corresponds to 5.712 hours or 228.96 ECTS (1 ECTS is equivalent to 25 hours of students' workload). The normal workload per semester is 18 - 20 CU; for 20 CU this is: 20 x 170 (minutes / week) x 14 (week / semester) = 47,600 minutes / semester or 793.33 hours / semester, which is equivalent to 31.73 ECTS.

Students with high academic achievements can take more courses (up to 24 CU) to speed up their studies; the academic advisor must approve this.

The peers point out that there can be no fixed conversion rate between CU and ECTS points, thus the ECTS points need to be determined and verified separately for each course. This can, e.g., be done by asking the students directly about the time they actually spend on each course. For this reason, it would be useful to include a respective question in the course questionnaires that are used for evaluating the quality of teaching and learning at the end of each semester. In any case, UNESA must make sure that the actual workload of the students and the awarded ECTS points correspond with each other.

Based on the module descriptions, the peers see that 25 hours of students' total workload are required for one ECTS point. However, the of students' total workload required for one ECTS point needs to be made transparent and should be incorporated in an official regulation.

According to the Self-Assessment Report, almost all students of the four undergraduate programmes under review complete their studies successfully. There are only very few students that drop out of the programmes. From 2014 to 2019, only two students dropped out of UPM and UPP, during the same period, six students dropped out of UPC, and there were no drop-outs in UPB.

As the submitted statistical data shows, the average study period for graduates over the last five years was slightly below eight semesters. Most students can complete their studies in exactly four years; some of them need even less time. In detail, the average length of studies within the last five years was 3.8 years in UPB, 4.3 years in UPC, 3.9 years in UPP, and 4.3 years in UPM.

The programme coordinators emphasise, that drop out students withdraw from the programme at their own request due to several reasons, not because they fail to complete their studies within the maximum period of seven years. Students leave the programmes because they are accepted at other universities, they take up a job, or they face financial or health problems.

In summary, the peers confirm that all four undergraduate programmes have a high but manageable workload.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions

- Discussions during the audit

Preliminary assessment and analysis of the peers:

Various teaching and learning methods (including lectures, computer training and classroom and lab exercises, field trips, individual and group assignments, seminars, and projects, etc.) have been implemented. Structured activities include tutorials, homework, assignments (reading or problem exercises) and practical activities. Group project assignments are given in some courses to develop students' skills in teamwork, communication, and leadership. The assignments and exercises should help students to develop their abilities with respect to critical thinking, written/oral communication, data acquisition, problem solving, and presentations.

The most common method of learning is class session, with several courses having integrated laboratory practices. Lecturers generally prepare presentations to aid the teaching process. With individual or group assignments, such as discussions, presentations, or written tasks, students are expected to improve their academic as well as their soft skills. Laboratory work covers laboratory preparation, pre or post-tests, laboratory exercises, reports, discussions, and presentations. In addition, practical activities should enable students to be acquainted with academic research methods.

To help students achieving the intended learning outcomes and to facilitate adequate learning and teaching methods, UNESA has developed an e-learning platform, where students and teachers can interact. Due to the Covid pandemic, online teaching has become an essential part of delivering the courses. Online-teaching at UNESA is done via the programme Vi-learning, also several other digital platforms are supported by UNESA, and recorded lectures are provided. Moreover, the Ministry of Education provides additional funds for students to pay for the additional costs of online-learning (e.g., mobile phone and internet fees).

In summary, the peer group considers the teaching methods and instruments to be suitable to support the students in achieving the intended learning outcomes. In addition, they confirm that the study concept of all four undergraduate programmes comprises a variety of teaching and learning forms as well as practical parts that are adapted to the respective subject culture and study format. It actively involves students in the design of teaching and learning processes (student-centred teaching and learning).

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report
- UNESA Academic Guideline
- Discussions during the audit

Preliminary assessment and analysis of the peers:

UNESA offers a comprehensive advisory system for all undergraduate students. At the start of the first semester, every student is assigned to an academic advisor. Each academic advisor is a member of the academic staff and is responsible for approximately 20 students from his classes. He/she is a student's first port of call for advice or support on academic or personal matters.

The role of the academic advisor is to help the students with the process of orientation during the first semesters, the introduction to academic life and the university's community, and to respond promptly to any questions. They also offer general academic advice, make suggestions regarding relevant careers and skills development and help if there are problems with other teachers. During the semester, counselling activities are usually offered three times, namely at the beginning of the semester (before the courses start), at mid-semester, and at the end of the semester. The students confirm during the discussion with the peers that they all have an academic advisor whom they can approach if guidance is needed.

In general, students stress that the teachers are open minded, communicate well with them, take their opinions and suggestions into account, and that changes are implemented if necessary.

The fourth-year students who prepare their final project have one or more supervisors, who are selected based on the topic of the final project. The thesis supervisor has the task to guide students in choosing suitable research topics, preparing the research proposal, conducting research, and writing the research report (Bachelor's thesis). One supervisor could be an external supervisor if the student performs the final project outside UNESA. The thesis supervisor will also assist students in preparing articles on the results of the research carried out. The process of implementing the guidance, monitoring, and evaluation of student thesis can be seen by accessing the thesis monitoring information system called SIMONTASI.

All students at UNESA have access to the digital academic information system (SIAKADU). The students' profiles (student history, study plan, academic transcript and grade point average/GPA, lecturer evaluation, course list) are available via SIAKADU. The learning system at UNESA is supported by the e-learning platform Vi-learning UNESA (Vinesa), which is integrated with SIAKADU and can be accessed via the internet. Moreover, during the Covid pandemic, many other online platforms such as Google Meet, Google Classroom, Zoom, Cisco WebEx, and Microsoft Teams were used.

To support students, there are several facilities at UNESA; they include a career centre, a campus clinic, WIFI-hotspots, a centre for information technology development, and a language centre.

Finally, there are several student organizations at UNESA, including student's activity clubs, which are divided into arts, sports, religious and other non-curricular activities.

The peers notice the good and trustful relationship between the students and the teaching staff; there are enough resources available to provide individual assistance, advice, and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully and without delay. The students are well informed about the services available to them.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

The peers appreciate that the programme coordinators will think about combining some small courses to larger modules during the next curriculum evaluation and revision. They also understand that some courses cannot be combined.

The peers thank FMNS for providing the lists of electives for the four undergraduate programmes and confirm that the electives are already grouped according to their scientific area.

The peers see that in UPP two compulsory courses related to simulation of the physical system, namely "Mathematical Physics" and "Computational Physics" are offered. In addition, in "Computational Physics", Python is used for interpreting algorithms and basic operations for solving physics problems. In UPC, the topic of modern bonding theory is discussed in the "Quantum Chemistry" course. Moreover, in the course "Computational Chemistry" also chemical modelling and computation of various aspects of chemical behaviour is discussed. Aspects of modern instrumental analytical chemistry are covered in the courses "Spectroscopy and Chromatographic Methods" and "Electrochemistry Analysis" in

semester 5, and "Practicum of Analytical Instruments" in semester 6. All three courses are mandatory courses for UPC students.

The peers appreciate that UPB will revise the curriculum by adding a course in bioinformatics and including genomics as a sub-topic in the genetics course, which will be renamed "Genetics and Genomics". In addition, UPB points out that a basic introduction to virology, mycology, and bacteriology is given in the course "Microbiology". Students who are interested in conducting a final project in microbiology have the opportunity to choose electives in bacteriology, mycology, or virology.

With respect to programming languages, UPM explains that besides Python other programming tools such as Matlab, Maple, GeoGebra, R, SPSS, and Minitab are used in some courses.

In general, the peers emphasise that it is important to keep up with new scientific and technological developments in all four degree programmes and to regularly adjust and update the curricula.

The peers support the plans of all four programmes to further promoting students' academic mobility and hope that more financial funds and places in international exchange programmes will be provided.

The peers are satisfied that a questions related to the students' actual workload for each course have been added to the students' satisfaction survey. The peers expect that the results are made transparent and that the awarded ECTS points are adjusted for each course.

The peers consider criterion 2 to be mostly fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Module descriptions
- UNESA Academic Guideline
- UNESA Academic Calendar

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, the students' academic performance is evaluated based on their attendance and participation in class, their laboratory works and reports, assignments, homework, presentations, mid-term exams, and the final exam at the end of each semester. The form of each exam is mentioned in the module descriptions that are available to the students via UNESA's homepage and the digital platform SIAKADU. Usually, there are two written exams in each course (besides the assignments, homework, and presentations); the mid-term exam is conducted in the 8th week of the semester and the final exam in the 16th week.

As stated in the Academic Guidelines, students' performance is usually assessed by participation (20 %), assignments (30 %), mid-term exam (20%), and final exam (30 %). Participation includes attendance (minimum of 75 %), asking and answering questions, activeness in a discussion or in an experiment (observation), and performance. Assignments include all laboratory reports, presentations, and quizzes that students should complete within a semester. Participation and assignments records are managed by each teacher, while mid-term and final exams are managed by the study programme. The grading system is different for the internship, the community service, and the final project.

The peers discuss with the teachers during the audit how participation is assessed and why it contributes as much as 20 % to final grade. They learn that participation includes the students' activity in class, their responsiveness and reasoning as well as their frequency and quality of inquiries. UNESA provides a rubric, which all teachers use to assess students' participation. However, the teachers confirm that it is difficult to assess participation objectively and that "quiet" students are in a disadvantage here. Consequently, the peers suggest reducing the share of participation in the final grade.

The assessment of the internship includes the students' performance during the internship (50 %), the internship report (20 %), and the internship seminar (30 %). A supervisor from the company/industry assesses the students' performance during the internship. The internship report describes a student's learning experiences during the internship activities and the result are presented in a seminar in front of the supervisor from UNESA and other students.

The community service is assessed by the supervisor based on four components, namely, (1) attendance and activeness (score 20%), (2) work programme plan (20 %), (3) students' performance during community services (30 %), and (4) a final report (30 %).

Every student in the four undergraduate programmes under review is required to do a final project (Bachelor's thesis). This project is conducted independently under the guidance of

one or more supervisors and usually consists of literature study, practical research, and data analysis. Both the student and his /her supervisors might decide the topic and content of the project. In many cases, the lecturers offer particular topics connected to their research. The Bachelor's thesis includes an oral defence in front of a board of examiners consisting of a chairperson, another examiner, and a thesis supervisor. The assessment components for the thesis examination comprise the written thesis (70 %) and students' performance during the oral defence (30 %). The final score for the thesis uses a scale of 0 - 100 and is obtained from the thesis examination score (70 %) and from the supervision processes (30 %).

The peers inspect a sample of final theses and have some doubts concerning the scientific demand and quality of the Bachelor's theses. Not all theses shown to the peers correspond to common scientific standards, as would have been expected based on the project description. The auditors consider scientific working standards, ethics in science, and concepts of writing scientific publications essential for graduating from a scientific study programme.

In order to meet international standards, the peers expect UNESA to reconsider the scientific depth and documentation of the theses. Students need to be better prepared to write scientific papers. This could be incorporated in the course "Research Methodology", which the students of all four programmes under review have to take in their fifth semester. Setting international standards will be the key for students to continue their academic education, particularly abroad, and will support graduates in finding a science-related job in the private sector or at universities. An appropriate scope and academic quality of the thesis must also be guaranteed in order to follow the vision of UNESA to become a nationally recognised research university.

The most common type of evaluation used are written examinations, which are either closed-book or open-book, and typically include short answers, essays, problem-solving or case-based questions, and calculation problems. Some lecturers also give multiple choice or true-false questions in examinations or quizzes. Students are informed about mid-term and final exams via the Academic Calendar. Students can access their results via UNESA's digital platform SIAKADU.

With respect to the final grades, the peers notice that the share of students with excellent grades is very high in some courses. They point out that it would be useful to make full use of the grading scale.

If students fail a course, they usually have to repeat the entire course in the following semester; it is usually not possible to retake just parts of the courses or to just retake the final exam. However, lecturers need to arrange examinations for students who have not taken

the examinations due to valid reasons (e.g., illness). In addition, the four degree programmes have a remedial process for the students who fail a mid-term exam. The further details for this are described in the UNESA Academic Guidelines.

The students appreciate that there are several short exams instead of one big exam and confirm that the exam load is appropriate and they are well-informed about the examination schedule, the forms of examination, and the rules for grading.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

The peers appreciate that FMNS will strengthen scientific writing, how to prepare publications and to cite scientific sources, and how use figures and diagrams in order to better prepare students for writing the Bachelor's thesis. However, the peers expect UNESA to submit current samples of Bachelor's theses from all four undergraduate programmes in order to verify if the scientific quality is aligned with international standards.

The peers welcome that UNESA will review and revise the contribution of each assessment component of the final grade and possibly reduce the share of participation.

The peers consider criterion 3 to be mostly fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-Assessment Report
- Staff Handbook
- Study plans
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

At UNESA, the staff members have different academic positions. There are professors, associate professors, assistant professors, and instructors. The academic position of each staff member is based on research activities, publications, academic education, supervision of students, and other supporting activities. For example, a full professor needs to hold a

PhD degree. In addition, the responsibilities and tasks of a staff member with respect to teaching, research, and supervision depend on the academic position.

According to the Self-Assessment Report, the teaching staff at the Faculty of Mathematics and Natural Sciences (FMNS) that support the undergraduate programmes UPB, UPC, UPM, and UPP currently consists of 141 full-time teachers (21 professors, 55 associate professors, 44 assistant professors, and 21 instructors).

The details are presented in the following table:

Category	Mathematics Department	Physics Department	Chemistry Department	Biology Department
Professors	5	5	9	2
Associate Professors	13	6	14	22
Assistant Professors	18	12	7	7
Instructors	3	9	4	5
Total Teaching Staffs	**39**	**32**	**34**	**36**

Source: UNESA Self-Assessment Report

The ratio of teaching staff to students in the Mathematics, Physics, Chemistry, and Biology Departments are 1:17, 1:18, 1:19, and 1:18.

57 % of the faculty members at FMNS hold a PhD from either a reputable Indonesian or international university (e.g., from Japan, Taiwan, Malaysia, Australia, the Netherlands, Germany, France, or the UK). The rest holds a Master's degree. Details of the academic qualifications of the teachers are described in the staff handbooks, which are accessible via the respective department's webpage. All fulltime members of the teaching staff are obliged to be involved in (1) teaching/advising, (2) research, and (3) community service. However, the workload can be distributed differently between the three areas from teacher to teacher. In addition, there are non-academic staff members consisting of librarians, technicians, and administrative staff.

In general, the percentage of teachers with a doctoral degree at FMNS (57 %) is rather low compared to international standards. The peers learn that several staff members are currently pursuing their doctoral studies at either international or at Indonesian universities. The peers support these efforts and strongly encourage FMNS to further increase the percentage of teachers with a PhD, either by hiring only new staff members that have already

a doctoral degree or by requiring more Master's degree holders to pursue doctoral studies. If UNESA wants to achieve its goal of becoming a nationally recognised research university, the spending on research and teaching, the number of publications in renowned international journals, and the share of teachers with a PhD degree should be significantly increased.

While analysing the staff handbooks, the peers notice that most of the staff members are also graduates from UNESA. Thus, they recommend also hiring new staff members that graduated from other universities.

The peers discuss with UNESA's management how new staff members are recruited. They learn that every year the faculties and departments announce their vacancies to UNESA's management, which subsequently announces the vacancies on UNESA's webpage. Since UNESA is semi-autonomous, they can suggest (after a selection procedure) to the Indonesian Ministry of Education which staff members to hire. One way to recruit new teachers is to send promising Master's students from UNESA abroad to complete their PhD and then to hire them as teachers when they are finished. Nevertheless, UNESA also hires graduates from other universities. Vacancies are announced nationally, so UNESA gets applications also from other universities.

During the audit, the peers inquire about the teaching load, and if there are enough opportunities for the academic staff members to conduct research activities. They learn that teachers at FMNS have a workload of 12 to 16 credits, the national maximum is 16 credits, so that teachers have enough time for all their activities including research; their average working time is 40 hours per week (12 credit units are equal to 2040 minutes/week or 6.80 hours/day). How much time staff members actually devote to research differs from teacher to teacher, because working hours are spent flexibly for teaching, research, and community service. Usually, teaching covers about 60 %, research activities 20 %, and community service another 20 % of their available time. The minimum teaching load is 6 credit units with 1 credit unit corresponding to 170 minutes per week. The teachers confirm that the teaching load is adequate and leaves enough room for conducting research activities and community service.

The peers notice that the research output of the academic staff members could be improved, especially concerning publications in renowned international journals. Since research activities carried out by the teaching staff should contribute to the content of the courses and students should be familiarized with independent academic research, it is important to increase the research output in science (biology, chemistry, mathematics, and physics). To reach international visibility, the amount of papers published in internationally peer-reviewed journals should be increased. In addition, the existing research activities

should be made more visible (e.g., by publishing them on the English webpage of the respective degree programme).

In summary, the peers confirm that the composition, scientific orientation, and qualification of the teaching staff – except of the mentioned weak points - are suitable for successfully implementing and sustaining the degree programmes.

The peers are impressed by the excellent and open-minded atmosphere among the students and the staff members. This atmosphere of understanding and support is one of the strong points of the degree programmes.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report
- Staff Handbooks
- Discussions during the audit

Preliminary assessment and analysis of the peers:
UNESA encourages training of its academic and technical staff for improving the abilities and teaching methods. As described in the Self-Assessment Report, faculty members attend courses in English language training, Information and Communications Technology (ICT), laboratory safety and instrumentation, writing publications, and e-learning. In addition, teachers have attended scientific meetings both internationally as well as in Indonesia in recent years, including CAPEU (International Conference on Science Technology, Engineering and Mathematics), ICRIEMS (International Conference on Research, Implementation, and Education of Mathematics and Sciences), AASEC (Annual Applied Science and Engineering Conference), and the Seminar on Mathematics and Natural Sciences at the National University of Malaysia. Furthermore, Applied Approach (AA) is a compulsory training for all staff members that focuses on advancing pedagogical knowledge. It is designed particularly for junior faculty members to introduce various teaching methods, as well as syllabus and course content development. All teachers at UNESA are obligated to attend the lecturer certification programme held by the Directorate General of Higher Education (Direktorat Jenderal Pendidikan Tinggi, DIKTI). An official teaching certificate is issued after the faculty member has completed the certification process.

Young staff members with a Master's degree are encouraged to pursue doctoral studies (usually abroad). To support this policy, UNESA provides foreign language training and organises seminars presenting scholarships from various sources.

During the audit, the peers inquire if the teaching staff has the opportunity to spend time abroad and to participate in international projects. They learn that UNESA and FMNS provide funds for joining international conferences, e.g., in Australia, USA, China, Japan, Thailand, Malaysia, Philippines, or other East Asian Countries but also in Europe (e.g., Turkey, Germany, Netherlands). Teachers can apply for financial support for their international activities by submitting a proposal to FMNS or UNESA. Moreover, teachers have the opportunity to receive funding from the Ministry of Research, Technology and Higher Education. The funding covers conference and publication fees, and expenses for accommodation and traveling.

The peers discuss with the members of the teaching staff the opportunities to develop their personal skills and learn that the teachers are satisfied with the internal qualification programme at UNESA, their opportunities to further improve their didactic abilities and to spend some time abroad to attend conferences, workshops, or seminars; even a sabbatical leave is possible.

In summary, the peers confirm that UNESA offers sufficient support mechanisms and opportunities for members of the teaching staff who wish for further developing their professional and teaching skills.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report
- Video of the facilities
- Discussions during the audit

Preliminary assessment and analysis of the peers:
Basic funding of the undergraduate programmes and the facilities is provided by UNESA and FMNS. The financial sources are government funding, tuition fees from students, community, and industry funding. Additional funds for research activities can be provided by UNESA or the Indonesian government (Bantuan Pendanaan Perguruan Tinggi Nasional, BPPTN), but the teachers have to apply for them.

UNESA distributes the budget (education, research, community services, infrastructure, facilities, and human resources) among the different schools and faculties according to the size of the student body (all undergraduate programmes have the same tuition fee). Nev-

ertheless, some study programmes (e.g., Chemistry) need more funds than other programmes because of the necessary instruments and technical equipment. This is also considered by UNESA's management when the yearly budget is allocated.

The provided budget allows the departments to conduct the study programmes as well as some specific activities, including student exchange programmes, student financial assistance for research, and participation in international conferences. The peers point out that the spending on research and teaching activities is rather low by international standards. Since UNESA has the goal to become a nationally recognised research university, it would be necessary to significantly increase (e.g., doubled) the investment in research.

In advance of the audit, the peer group received videos showing some of the laboratories at the Faculty of Mathematics and Natural Sciences. They notice that there seem to be no bottlenecks due to missing equipment or a lacking infrastructure. The technical equipment for teaching the students on a Bachelor's level is available. Moreover, the peers learn during the audit that students can use and operate the instruments in the laboratories by themselves after being trained and instructed by either senior students or lab technicians. Each laboratory has a lab supervisor, in addition, there are several senior students (4th year) that work as lab assistants.

The academic staff members emphasise that from their point of view, all four undergraduate programmes under review receive sufficient funding for teaching and learning activities. There are no serious difficulties associated with either human resources in terms of lecturers and lab assistants available or other supporting facilities to conduct the teaching and learning activities. The lab equipment is in sound condition and is adequate and feasible to support academic activities in both classroom and laboratory settings. The students confirm this positive impression and state their satisfaction with the available resources.

However, the peers see that usually students do the experiments together in groups of three to five students (depending on the course). Since it is very important for students to gain sufficient practical experience in laboratory work, the peers expect UNESA to provide enough instruments and laboratory space so that the experiments can be conducted by groups of not more than two to three students. Otherwise, students may not acquire the necessary hands-on experience in conducting experiments and carrying out practical laboratory work.

During the audit, the students express their satisfaction with the library and the available literature there. There are sufficient local and international publications and scientific literature. Students can remotely access international databases, such as SpringerLink or Cambridge Scientific Abstracts.

In summary, the peer group judges the available funds, the technical equipment, and the infrastructure (laboratories, library, seminar rooms etc.) to comply – except of the mentioned restrictions- with the requirements for adequately sustaining the degree programmes.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

The peers appreciate that UNSEA encourages all teachers to publish scientific paper and that the 2022 call for new academic staff members is only for PhD holders. In general, UNESA and FMIPA should significantly increase the funding for research activities. To this end, additional projects with private companies could be established.

The peers emphasise that it is very important for all UPB, UPC, and UPP students to get sufficient hands-on experience with instruments and practical laboratory work. For this reason, UNESA should update and increase the instruments and the technical equipment in the teaching laboratories so that experiments can be done by groups of not more than two to three students.

The peers consider criterion 4 to be mostly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-Assessment Report
- Module descriptions
- Webpage Ba Biology : https://s1-biologi.fmipa.unesa.ac.id/
- Webpage Ba Chemistry : https://s1-kimia.fmipa.unesa.ac.id/
- Webpage Ba Mathematics : https://s1-matematika.fmipa.unesa.ac.id/
- Webpage Ba Physics : https://s1-fisika.fmipa.unesa.ac.id/

Preliminary assessment and analysis of the peers:
The students, as all other stakeholders, have access to the module descriptions via UNESA's homepage.

After studying the module descriptions, the peers confirm that they include almost all necessary information about the persons responsible for each module, the teaching methods and work load, the awarded credit points, the intended learning outcomes, the content, its applicability, the admission and examination requirements, as well as their forms of assessment.

However, the information about the teaching format in the module description should be updated; it is not always clear what course is a lecture and what course includes laboratory work. The module descriptions need to make transparent how many hours students spend in the laboratory in each course and what laboratory work is done. In addition, the literature references should be updated.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- Sample Transcript of Records for each degree programme
- Sample Diploma Supplement for each degree programme

Preliminary assessment and analysis of the peers:
The peers confirm that the students of all four degree programmes under review are awarded a Diploma and a Diploma Supplement after graduation. The Diploma consists of a Diploma Certificate and a Transcript of Records. The Diploma Supplement contains all required information about the degree programme. The Transcript of Records lists all the courses that the graduate has completed, the achieved credits, grades, and cumulative GPA.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report
- All relevant regulations as published on the university's webpage

Preliminary assessment and analysis of the peers:
The peers confirm that the rights and duties of both UNESA and the students are clearly defined and binding. In the course of the review procedure, UNESA has updated the UPB and UPC homepages, so that now the English homepages of all four degree programmes

include all the necessary information about the programmes (study plans, learning outcomes, module description, and link to academic guidelines).

The peers discuss with UNESA about the admission of students with disabilities, particularly colour-blindness, as this is a known issue in Indonesia. The university stresses that it follows a general non-discrimination policy and that students with disabilities are eligible for admission into the programmes. The peers understand that applicants with colour-blindness are not admitted to UPB, UPC, and UPP. They are aware that this is common practice at Indonesian universities, but are convinced that it is unnecessary. The peers emphasise that with modern tools and technology, colour-vision is no longer an important ability even in laboratories. Regarding the study programmes at hand, it is even less of an issue as the experiments are conducted in groups and the colour-blindness of one student can be easily compensated by the other group members. Hence, they consider such an admission criterion too restrictive and expect UNESA to change it.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

The peers confirm that the module descriptions of all four degree programmes have been updated and now include information about the students' total workload, the teaching format, and the practical laboratory work.

The peers consider criterion 5 to be fulfilled.

6. Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- UNESA Academic Guidelines
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The peers discuss the quality management system at UNESA with the programme coordinators and the students. They learn that there is a continuous process in order to improve

the quality of the degree programmes and it is carried out through internal (SPMI) and external quality assurance (SPME).

The SPMI process involves units at three management levels, i.e., university level, faculty level and programme level. The quality assurance system at university level is run by the Quality Assurance Centre (SPM), which coordinates the Quality Assurance Groups (GPM) at faculty level. At each department, there is a Quality Assurance Unit (UPM), which is responsible for quality assurance at programme level.

SPM is the unit responsible directly to the Rector with the main role to perform the QA process on university level. SPM is responsible for the continuous improvement of degree programmes through monitoring, assessing, and analysing the processes. To this end, SPM prepares the guidelines and quality standards for all degree programmes and conducts internal curriculum audits. In addition, SPM also conducts different customer satisfaction surveys.

At the faculty level, the quality assurance process is organized by the Quality Assurance Group (GPM). The GPM is working directly under the respective dean. Its role is to ensure the quality of all processes and research activities in each degree programme. The main role of GPM is to implement academic standards and guidelines at faculty level in accordance with the quality standards developed by SPM.

The quality assurance at programme level is primarily conducted by the Programme Coordinator and by Quality Assurance Unit (UPM). One of UPM's duties is to monitor the implementation of the curriculum at programme level. In addition, the Programme Coordinator and UPM have the task to assess if the programme learning outcomes (PLO) and course outcomes (CLO) have been achieved. Every year, the Quality Assurance Units submit a report on the al processes including recommendations on how to improve the quality of the respective degree programme.

The internal evaluation of the quality of the degree programmes is mainly provided through student and alumni surveys. Students give their feedback on the courses through online questionnaires at the end of each semester. Students assess various aspects such as students' understanding, lecturers' responsiveness, course delivery, lecturers' proficiency, explanation of course objectives, and references in each enrolled course. Students' opinion is quantified by means of index 1 (unsatisfactory) to 4 (excellent). Giving feedback on the classes is compulsory for the students; otherwise, they cannot access their account on the digital platform SIAKADU.

The department head can access the students' feedback and responses to each course via SIAKADU. Each teacher can see the average score of the students' feedback from their account in SIAKADU. The results of course evaluation questionnaires are published on the FMNS website.

In addition, each department regularly conducts an alumni tracer study. By taking part at this survey, alumni can comment on their experiences at UNESA, the waiting period for employment after graduation, their professional career and can give suggestions how to improve the programme. Furthermore, there is the Career Centre at UNESA, which offers help to find suitable internships, announces job vacancies, and organises courses to develop soft skills. The management of the alumni network at UNESA is conducted through coordination with the UNESA Career Center (UCC) through providing opportunities for alumni as speakers in soft skills development, career development, and continuing studies. In addition, alumni take part at the UNESA Virtual Career Fair (UVCF) in sponsorship and information on job vacancies.

External quality assurance focuses on both national and international accreditations. National accreditation is conducted by the National Accreditation Board for Higher Education (BAN-PT), under the Ministry of Education and Culture, Republic of Indonesia. National accreditation of the programme within the university is a legal obligation for every study programme. According to the latest evaluation by BAN-PT, all four undergraduate programmes under review have obtained the highest accreditation status (A).

During the audit, the peers learn that if there is negative feedback, the head of department on behalf of the dean organises a personal meeting with the respective lecturer. In the meeting, the head of department discusses with the lecturer the best way to handle the problem and the lecturer is firmly encouraged to improve his/her performance in the next semester. The peers gain the impression that students' feedback is taken seriously by the faculties and changes are made if there is negative feedback. There are regular meetings (every semester) with students called "open dialog" on university, faculty and department level where students can voice their issues and suggestions. The students' representatives for those meetings are elected by their fellow students. Both lecturers and students can share their thoughts about their respective degree programmes in this forum. Part of the discussion are the results of the course questionnaire and how the teaching and learning processes can be further improved.

The peers see that there are regular meetings with all stakeholders on faculty and programme level where they discuss the needs and requirements of the employers and possible changes to the degree programmes.

As the peers consider the input of the employers to be very important for the further improvement of the degree programmes, they appreciate the existing culture of quality assurance with the involvement of external stakeholders in the quality assurance process. Moreover, UNESA and the Faculty of Mathematics and Natural Sciences stay in close contact with their alumni. As a result, through the UNESA alumni association, alumni make voluntary donations to help financing the degree programmes. In addition, FMNS has established advisory boards with external stakeholders for all four degree programmes under review. Moreover, there are several student associations on department level (HMJ, Himpunan Mahasiswa Jurusan) and on faculty and university level (BEM, Badan Executive Mahasiswa Universitas). The peers appreciate the comprehensive quality assurance system with involvement of all stakeholders, which is a strong point of the undergraduate programmes.

However, the peers notice that the students are not members of the boards at UNESA. The peers are convinced that it would be very useful to have student members in the different boards. For this reason, they recommend that student representatives should be official members of boards at UNESA (at least on programme and faculty level) and be actively involved in the decision-making processes for further developing the degree programmes.

In summary, the peer group confirms that the quality management system is suitable to identify weaknesses and to improve the degree programmes. All stakeholders are involved in the process.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

The peers appreciate that all four programmes will follow their suggestion and make students official members of curriculum board for further developing the degree programmes.

The peers consider criterion 6 to be fulfilled.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

- none

E Comment of the Higher Education Institution (20.05.2022)

UNESA provides the following statement:

RESPONSES TO ASIIN'S FEEDBACK

CRITERION 1 THE DEGREE PROGRAMME: CONCEPT, CONTENT & IMPLEMENTATION

FEEDBACK 1:

With respect to the Bachelor's thesis, the peers point out that students need to be introduced to scientific writing and learn how to prepare publications, how to cite scientific sources, and how use figures and diagrams. The peers see that the provided sample theses are somewhat deficient in these areas (see criterion 3).

RESPONSE 1:

At FMNS, students have actually been equipped with knowledge and experience of scientific writing, how to cite scientific sources, and how to use figures and diagrams through courses including seminars, research methodologies, and colloquiums. Starting at next semester (Odd semester 2022-2023), study programs will strengthen scientific writing and learn how to prepare publications, how to cite scientific sources, and how use figures and diagrams in these courses as a provision for students to write theses and publication articles. List of students' publication is available in response 2 of criterion 3.

For each study program, students' provision of scientific writing skills and learn how to prepare publications, how to cite scientific sources, and how to use figures and diagrams is discussed below:

UPM

In UPM, our students have been taught an academic writing. This course examines various concepts and theories related to scientific writing techniques, as well as practising

writing scientific papers. Concepts/theories to be studied include the nature and characteristics of scientific papers, preparation for writing scientific papers, use of libraries in writing scientific papers, components of scientific papers, tips for writing scientific papers, reviews, finalisation and dissemination of scientific works through active learning based on assignments presented in the form of theory.

In addition, there are also some courses that train students to write scientifically through several assignments such as mathematical modelling, dynamical systems, fuzzy theory, topology, and seminar (link module handbook)

UPP

In UPP, three courses aim to prepare our students to finish their final project for graduation: Research Methodology, Colloquium or Seminar, and Thesis (Link for module handbook). These three courses are compulsory and programmed by students sequentially in semesters 5, 6, and 8. In these three courses, students have been introduced to scientific writing, how to make a publication, cite scientific sources, and use figures and diagrams. The research methodology course specifically introduces research methods applied in Physics field study to the students. Meanwhile, Colloquium discusses recent advanced research in Physics. This course also teaches writing composition with practical learning as a strategy for academic purposes. The practical learning activities involve brainstorming on issues relevant to Physics, writing a Physics research proposal, and conducting a seminar. All the learning activities are meant to improve students' communication skills, both oral and written. The students must pass these two compulsory courses before they can program Thesis. The Thesis is designed to give research experience to the students, which is essential for their future careers.

UPC

Students have been introduced to scientific writing and learned how to prepare for publication, how to cite scientific sources, and how to use numbers and diagrams through the chemistry library course. Each student gets an individual assignment at the end of the lecture to compile scientific papers by paying attention to scientific writing, how to cite

scientific sources, and bibliography as a form of scientific accountability. Training in scientific writing, how to cite scientific sources reinforced in research methodology courses, seminars, and theses. To prepare for scientific publications, students have obtained the course of the chemistry library, as well as periodic scientific article writing training by the UPC journal team.

For practicum courses, after completing practicum students are required to compile a practicum report consisting of writing titles, backgrounds, theories, work steps, writing experimental data, conducting analysis, drawing conclusions, and writing a bibliography. This is an effort to train scientific writing and publish research results.

The following is an example of a thesis: thesis, and articles written by a student and published in an international journal: publication 1; publication 2.

UPB

Improvement of students related to their abilities in scientific writing is started in 4th semester in Biostatistics and Biocomputer courses which teach students various types of biological research, how to collect data, process data, and analyse data, which includes the concept of mean, standard deviation, distribution data, hypothesis testing, various types of data analysis including Analysis of Variance (Anova), correlation-regression analysis, covariance analysis, non-parametric analysis both theoretical and practical with computers. Students are also taught how to process and organise data using computer programs in various forms such as diagrams, histograms, and tables (Biostatistics and Biocomputer module handbook).

In the following semester, students receive Biological Research Methodology courses, Seminars, and Elective Courses to expand their knowledge and scientific writing skills. In the Biology Research Methodology course, students get the basics of scientific writing, starting with determining research topics, compiling the background why research is carried out with the chosen topic, formulating research problems, formulating research objectives, formulating research benefits, how to cite library sources, how to cite reference sources using software such as Mendeley, develop a research framework, determine research variables, develop research designs, and how to develop procedures in research. The product of this course is that each student prepares a research proposal which will

later become a final research project (thesis) (Biology Research Methodology module handbook). Students also receive seminar courses, in which students gain knowledge of various types of scientific forums, how to compile and review articles, how to publish research results and present in scientific forums, and how to communicate with good ethics in scientific forums. Students practice making posters, power points to present research proposals which will later become final research projects (thesis) (Seminar module handbook).

FEEDBACK 2:

In the "regular classes" most of courses are delivered in Bahasa Indonesia (Indonesian language), however part of the teaching materials and most of the textbooks are provided in English. Information about the curriculum is available for students in the digital academic information system and on the programme's homepage. Furthermore, students are encouraged to attend summer courses that are held in English with international students and guest lecturers. Nevertheless, the active English speaking skills of the students in the regular classes should be further improved. This could, for example, be done by conducting presentations in English or by discussing current scientific publications.

RESPONSE 2:

UPM

Students in regular classes are encouraged to improve English speaking skills through academic and non-academic activities. UPM has English course for second semester students in which students learn about language skills and components at the basic level (pre-intermediate), standardized tests that include exercises for reading skills, listening comprehension, grammar, vocabulary, technical terms used in mathematics and thesis abstract writing techniques in English. Lecture activities are carried out in a student centre with discussions, observations, project assignments, and presentations. In addition, some courses like academic writing, seminar, dynamical systems, mathematics modelling, and fuzzy theory lead students to discuss and present current scientific publications.

UPP

In the “regular classes” most of the courses are delivered in Bahasa Indonesia (Indonesian language), however part of the teaching materials and most of the textbooks are provided in English. Information about the curriculum is available for students in the digital academic information system and on the programme’s homepage. Furthermore, students are encouraged to attend summer courses that are held in English with international students and guest lecturers. Nevertheless, the active English speaking skills of the students in the regular classes should be further improved. This could, for example, be done by conducting presentations in English or by discussing current scientific publications.

Besides that, there are English for Physics courses in UPP. The regular classes also use English for all communication forms in this course. English for physics gives the practice for reading, listening, speaking, and also writing. The reading and listening practice uses the basic physics topics. There are some projects for students to practise their skills for speaking and listening. Such as conducting a basic physics experiment, then report and present it in English. Students also study writing skills for academic writing results (such as writing tasks in an IELTS for academic and scientific papers). The students make the academic writing paper based on the literature review and make the poster based on it, also present it in the final class. In Materials Science and Polymer Physics courses, student are trained to review relevant articles published in English.

UPC

Although the language of instruction in regular classes is different from international classes, UPC tries to encourage regular class students to take part in international activities, such as international mobility and attending visiting lecturers. There are several courses that also train students to review international publications, rewrite them, and present them in class in English, either orally or in text. For example, English, English for chemistry, basics of chemical separations, and seminar courses. Even some of the regular class students also attend international seminars and do international publications.

UPB

UPB also pays attention to the English skills of regular class students. All students are required to program English for Biology courses which teach students to communicate in English and understand English content. Almost all courses also use English references, thus students are encouraged to actively speak English. On several occasions, regular class students are also given the opportunity to present the results of their group's work in English, for example the Natural Resources and Environment Conservation course, Animal Systematics, and several elective courses.

FEEDBACK 3:

In summary, the peers find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes. However, the peers learn that applicants with colour-blindness are not admitted to UPB, UPC, and UPP. They are aware that this is common practice at Indonesian universities, but are convinced that it is unnecessary, because experiments are conducted in groups and the colour-blindness of one student can be easily compensated by the other group members. Hence, they consider such an admission criterion too restrictive and expect UNESA to change it (see also criterion 5.3).

RESPONSE 3:

In 2022 prerequisite, new student admissions no longer require color blindness, all students can choose all study programs at FMNS. This can be seen at the following link https://admisi.unesa.ac.id/page/sbmptn; https://admisi.unesa.ac.id/page/snmptn; https://admisi.unesa.ac.id/page/tata-cara-pendaftaran.

CRITERION 2. THE DEGREE PROGRAMME: STRUCTURES, METHODS AND IMPLEMENTATION

FEEDBACK 1:

However, the peers point out that there is a large number of small modules in each degree programme which increases the exam load of the students. For example, in UPC the courses “Thermodynamics of Chemistry” and “Chemical Kinetics” could be part of a module “Physical Chemistry”, the same applies to courses that could belong to modules called “Inorganic Chemistry” or “Organic Chemistry”. There are similar examples in UPB and UPP. For this reason, it would be useful to revise the curricular structure by combining related courses to larger modules. A coherent curriculum is useful in order to make clear how the courses build on each other. Combining small courses to larger modules helps to provide a better structure to the curriculum.

RESPONSE 1:

The curriculum structure of the undergraduate program at Unesa is modularized where the modules are in the form of courses.

UPP

Regarding the Feedback from the peers about many small modules in each degree, UPP will consider this Feedback carefully for conducting curriculum evaluation and reconstruction. Some courses identified as small modules are elective courses that facilitate students who want to research in a particular field, such as Earth Physics, Physics Material, and Physics Instrumentation. For example, the elective course in Physics Material, Thermodynamics of Material, cannot be combined with Thermodynamics. Thermodynamics is a compulsory course that has become a pre-requested course for Thermodynamics of materials with specialization in Physics Material field of study.

UPC

UPC develops a handbook module based on each existing course where each semester consists of several courses from the chemistry scientific group, such as physical chemistry, inorganic chemistry, organic chemistry, etc. If these two courses (Thermodynamics of Chemistry and Chemical Kinetics) are combined in the same semester, it will increase the student workload in that semester because students program several other courses as well. If physical chemistry is made into one large package of courses, then the

workload is too large and less flexible for students in programming the courses each semester, so it is necessary to split the physical chemistry courses into thermodynamics courses, chemical kinetics and dynamics courses, and quantum chemistry courses. The rationale for its preparation begins with quantum chemistry as a requirement for taking kinetics and chemical dynamics courses as well as thermodynamics courses.

The Thermodynamics of Chemistry module was also developed by UPC based on the understanding that the content in this course needs to be understood before studying Chemical Kinetics. However, in the development of this module, UPC developed it in a lecture team that is a member of the Physical Chemistry lecturer so that the content developed will definitely be in accordance with their respective team of expertise.

The same thing was also done in the development of modules in the team's lectures for Inorganic Chemistry and Organic Chemistry. In the UPC curriculum, there are monofunctional organic compounds courses and polyfunctional organic compounds courses which are given in separate semesters because the first course is the basis and requirement for the second courses. Monofunctional organic compounds are given in the earlier semesters to provide students with initial provisions in understanding of organic compounds, such as the structure theory, characteristics of monofunctional groups. Students must master well concepts of organic compounds with one functional group in monofunctional organic compounds course, namely alkane, alkene, alkyne, alcohol, ether, aldehyde, ketone, carboxylic acid, ester, and amine before taking polyfunctional organic compounds course at the next semester. In the next semester, there will be polyfunctional organic compounds courses accompanied by practicum of organic chemistry courses for both monofunctional and polyfunctional compounds. Thus, it is hoped that it will not increase the exam load of students, but can achieve a comprehensive understanding.

The inorganic chemistry course covers a range of topics to highlight the importance of inorganic chemistry subject including basic inorganic theory (bonding theory, acid-base chemistry, solid-state chemistry), the application of inorganic chemistry material (the element and their compounds consist of transition metal and main group elements), advanced inorganic chemistry (coordination chemistry, inorganic reaction mechanism). The module is developed based on the topics of the inorganic chemistry course. According to

the UPC curriculum, basic inorganic theory course is given earlier to provide the student with the fundamental principles of inorganic chemistry which is useful for students to study the higher inorganic chemistry course. In the next level of semester, students will be able to understand the inorganic chemistry of the world today through the main group element course and transition elements course. Advanced inorganic chemistry will be also studied by students to provide the upper knowledge of inorganic chemistry subjects. There is also an inorganic chemistry practicum course which provide the students with laboratory work of inorganic chemistry topics to support the students' laboratory skills.

UPB

The curriculum structure of UPB is also modularized where the modules are in the form of courses. The modules in the form of these courses are determined after determining the Program Learning Outcome so that each defined course will automatically lead to the achievement of learning outcomes that are determined according to their disciplines. Some courses, especially elective courses, have small credit units but cannot be combined with other courses because there are prerequisite courses that must be programmed. For example, General Chemistry (3 CU) cannot be combined in one module with Biochemistry (3 CU) because General Chemistry is a prerequisite for programming Biochemistry.

FEEDBACK 2:

There is a similar issue with respect to the electives. First, it would be useful to increase the number of electives and, secondly, it is recommended to group the electives according to their scientific focus. This would help students to select suitable electives so that they have a better orientation and can develop their personal scientific profile.

RESPONSE 2:

UPM

UPM already updated the group of elective courses according to the scientific focus and it can be seen in this link https://s1-matematika.fmipa.unesa.ac.id/page/curriculum-structure.

UPP

To help students select suitable elective courses in their undergraduate program, UPP research groups have the elective courses to help students have a better orientation and can develop their personal scientific profile. The following is a grouping of elective courses at UPP.

Table 2.1 List of elective course from Earth Physics research group

No	Course Code	Course Name	CU	ECTS
1.	4520102075	Physical Oceanography	2	3.18
2.	4520102007	Physical System Analysis	2	3.18
3.	4520102077	Physics of Seismology	2	3.18
4.	4520102252	Introduction to Geodynamics and Geothermal	2	3.18
5.	4520102142	Geophysical Measurement Method	2	3.18
6.	4520102254	Geophysical Fluids Dynamics	2	3.18
7.	4520102248	Physics of Atmosphere	2	3.18
8.	4520102058	Physics of Volcanoes	2	3.18
9.	4520102246	Physics of Tsunami	2	3.18
10.	4520102247	Mitigation of Natural Disasters	2	3.18
11.	4520102156	Structured Programming	2	3.18
12.	4520102135	Physics Data Inversion Method	2	3.18

Table 2.2 List of elective course from Material Physics research group

No	Course Code	Course Name	CU	ECTS
1.	4520103018	Alloy Material	2	3.18
2.	4520103111	Diffraction Data Analysis	2	3.18
3.	4520103210	Thermodynamics of Materials	2	3.18

No	Course Code	Course Name	CU	ECTS
4.	4520102067	Metal Physics	2	3.18
5.	4520103109	Corrosion	2	3.18
6.	4520103130	Material Fabrication Methods	2	3.18
7.	4520102251	Medical Physics	2	3.18
8.	4520102076	Polymer Physics	2	3.18
9.	4520102098	Ceramics	2	3.18
10.	4520103137	Material Characterization Method	2	3.18
11.	4520103244	Energy Materials	2	3.18
12.	4520102096	Capita Selecta Material Physics	2	3.18
13.	4520102245	Medical Materials	2	3.18

Table 2.3 List of elective course from Instrumentation Physics research group

No	Course Code	Course Name	CU	ECTS
1.	4520102237	Control System	2	3.18
2.	4520103169	Digital Signal Processing	2	3.18
3.	4520102250	Sensor	2	3.18
4.	4520103037	Electroacoustic	2	3.18
5.	4520102009	Antenna and Propagation	2	3.18
6.	4520102197	Microcontroller	2	3.18
7.	4520102150	Optoelectronics	2	3.18
8.	4520102242	Robotics	2	3.18
9.	4520102195	Optical communication system	2	3.18
10.	4520102045	Optical instrumentation	2	3.18

No	Course Code	Course Name	CU	ECTS
11.	4520102259	Digital Image Processing	2	3.18

UPC

To help students select suitable electives, UPC groups elective courses to help them have a better orientation and can develop their personal scientific profile. The following Tables 2.4-2.6. are a grouping of elective courses at UPC.

Table 2.4 List of Elective Course from Research Area Natural Product Chemistry Phytopharmaceutical-Immunostimulant Drugs Group

No.	Course Code	Course Name	Credit Unit	ECTS
1.	3074112061	Computational Chemistry	2	3.18
2.	3074112063	Pharmaceutical Chemistry	2	3.18
3.	3074112069	Natural Product Chemistry	2	3.18
4.	3074112070	Cosmetics	2	3.18
5.	3074112068	Capita Selecta	2	3.18
6.	3074112076	Research Technique of Biochemistry	2	3.18
7.	3074112077	Toxicology	2	3.18
8.	3074112080	Bio-inorganic	2	3.18
9.	3074112062	Stereochemistry	2	3.18
10.	3074212032	Literature of Chemistry	2	3.18
11.	3074112065	Career Development	2	3.18
12.	3074212043	Industrial Chemistry	2	3.18
13.	3074112078	Biotechnology	2	3.18

Table 2.5 List of Elective Course from Research Area Material Chemistry and Renewable Energy Group

No.	Course Code	Course Name	Credit Unit	ECTS
1.	3074112061	Computational Chemistry	2	3.18
2.	3074112064	Organometallic Compound	2	3.18
3.	3074112068	Capita Selecta	2	3.18
4.	3074112080	Bio-inorganic	2	3.18
5.	3074212056	Mechanism of Inorganic Reaction	2	3.18
6.	3074112074	Electrochemistry	2	3.18
7.	3074212036	Nuclear Chemistry and Radioche-mistry	2	3.18
8.	3074212032	Literature of Chemistry	2	3.18
9.	3074112065	Career Development	2	3.18
10.	3074112071	Material Chemistry	2	3.18
11.	3074112073	Solid State Chemistry	2	3.18
12.	3074112079	Organic Polymer Chemistry	2	3.18

Table 2.6 List of Elective Course from Research Area Bioactive Compounds Group

No.	Course Code	Course Name	Credit Unit	ECTS
1.	3074112061	Computational Chemistry	2	3.18
2.	3074112069	Natural Product Chemistry	2	3.18
3.	3074112070	Cosmetics	2	3.18
4.	3074112066	Food Analysis	2	3.18
5.	3074112067	Evaluation of Nutritional Value of Food	2	3.18
6.	3074112068	Capita Selecta	2	3.18

No.	Course Code	Course Name	Credit Unit	ECTS
7.	3074112076	Research Technique of Biochemistry	2	3.18
8.	3074112077	Toxicology	2	3.18
9.	3074212032	Literature of Chemistry	2	3.18
10.	3074112065	Career Development	2	3.18
11.	3074112072	Microbiology	2	3.18
12.	3074113075	Food Chemistry	2	3.18
13.	3074212043	Industrial Chemistry	2	3.18
14.	3074112078	Biotechnology	2	3.18

UPB

The elective courses in UPB are created based on various field of research groups of teaching staff in UPB. The tables below present the grouping of electives based on research groups in UPB (Table 2.7-2.10).

Table 2.7 List of elective courses from Microorganism Bioprospection in Various Fields of Life group

No.	Course code	Course name	Credit unit	ECTS
1.	4620102022	Bacteriology *)	2	3.18
2.	4620102083	Population Genetics *)	2	3.18
3.	4620102125	Mycology *)	2	3.18
4.	4620102130	Industrial Microbiology*)	2	3.18
5.	4620102162	Microbial Systematics*)	2	3.18
6.	4620102084	Applied Genetics*)	2	3.18
7.	4620102131	Health Microbiology **)	2	3.18
8.	4620102132	Environmental Microbiology * *)	2	3.18
9.	4620102190	Virology**)	2	3.18

Table 2.8 List of elective courses from Management of Ecosystem and Tropical Natural Resources group

No	Course code	Course name	Credit unit	ECTS
1.	4620102038	Cultivation of water biota *)	2	3.18
2.	4620103049	Ocean Ecology *)	2	3.18
3.	4620102054	Ecotoxicology *)	2	3.18
4.	4620102061	Entomology *)	2	3.18
5.	4620102156	Protozoology *)	2	3.18
6.	4620102007	Analysis of environmental impact*)	2	3.18
7.	4620102050	Social ecology *)	2	3.18
8.	4620102114	Malacology* *)	2	3.18
9.	4620102115	Mammalogy* *)	2	3.18
10.	4620102146	Management of Natural resources * *)	2	3.18
11.	4620102112	Limnology *)	2	3.18
12.	4620102116	Management of Water Ecosystems *)	2	3.18
13.	4620102140	Parasitology *)	2	3.18
14.	4620102144	Waste management*)	2	3.18
15.	4620102153	Planktonology *)	2	3.18
16.	4620102191	Zoogeography*)	2	3.18
17.	4620102051	Soil Ecology *)	2	3.18
18.	4620102139	Ornithology* *)	2	3.18
19.	4620102148	Environmental Science * *)	2	3.18

Table 2.9 List of elective courses from Tropical Animal Bioprocess Based on Local Wisdom group

No	Course code	Course name	Credit unit	ECTS
1.	4620102060	Endocrinology*)	2	3.18
2.	4620102158	Animal reproduction*)	2	3.18

3.	4620102009	Human anatomy and physiology*)	2	3.18
4.	4620102029	Food biology *)	2	3.18
5.	4620102088	Histology* *)	2	3.18
6.	4620102094	Immunology *)	2	3.18
7.	4620102063	Ethology*)	2	3.18
8.	4620102075	Comparative Physiology*)	2	3.18
9.	4620102138	Oncology**)	2	3.18

Table 2.10 List of elective courses from Sustainable Agroecosystem Based on Local Wisdom group

No	Course code	Course name	Credit unit	ECTS
1.	4620102059	Plant Embryology *)	2	2
2.	4620102078	Phytohormone *)	2	3.18
3.	4620102062	Ethnobotany *)	2	3.18
4.	4620102066	Pharmacognosy *)	2	3.18
5.	4620102077	Phytogeography *)	2	3.18
6.	4620102179	Numerical taxonomy* *)	2	3.18
7.	4620102090	Horticulture	2	3.18
8.	4620102092	Nutrient science *)	2	3.18
9.	4620102136	Plant morphogenesis *)	2	3.18
10.	4620102085	Plant Pests and Diseases * *)	2	3.18
11.	4620102003	Algology *)	2	3.18

FEEDBACK 3:

The peers point out that UNESA should regularly adapt the curricula to technological advancements and current developments in the respective sciences (e.g., bioinformatics, genomics, analytical and computational chemistry, artificial intelligence, and data science), in order to prepare graduates even better for the requirements of the job market.

With respect to UPB, the peers point out that important subjects e.g., bioinformatics, and

genomics are missing in the curriculum. In addition, several essential courses, such as virology, mycology, and bacteriology should be compulsory courses and not just electives.

In UPC, courses in modern bonding theory, modern instrumental analytical and computational chemistry should be added to the curriculum. In addition, it should be clarified how many practical courses are offered in the degree programme. This includes a clear description how many hours of practical work the students have in each course.

In UPM, courses in number theory and complex analysis are missing in the curriculum.

In UPP, course in simulation of physical system.

RESPONSE 3:

UPM

In the Undergraduate Program of Mathematics, we offer two courses related to number theory, firstly “Elementary Number Theory” which is given in the third semester and it is a compulsory course. Secondly, “Number Theory” is given as an elective course. There is also complex analysis course that we offer in the curriculum and it is also given as an elective course. The curriculum structure can be seen in the following link https://s1-matematika.fmipa.unesa.ac.id/page/curriculum-structure

UPP

In the Undergraduate Program of Physics, we offer two courses related to simulation of the physical system, namely “Mathematical Physics” and “Computational Physics”. These courses are compulsory, and should be programmed in the even semester. The physical system which is related to the programming language used in these courses, for example, is Python. In Mathematical Physics, Python helps students to make a comparison in calculations in mathematical physics problems analytically, as an alternative solution, fitting, approximation, and visualising graphs/curves in both 2D and 3D coordinates. Furthermore, knowledge from this course can be applied to elective courses in Material Physics, Instrumentation Physics, and Earth Physics. Meanwhile, in Computational Physics, Python is discussed for interpreting algorithms and basic operations used in solving physics prob-

lems. For example, it is used as numerical methods for solving nonlinear equations numerically, linear algebraic, interpolation and extrapolation, regression methods, numerical differentiation and numerical integration.

UPC

The topic of modern bonding theory is already in the Quantum Chemistry course. In this course, topics are presented on the basic concepts and principles of Quantum Chemistry covering the underlying postulates; the application of quantum chemistry to translational, vibration and rotation motion; the structure of the hydrogen atom and many-electrons atom; atomic spectra; molecular structure, including modern bonding theory; molecular symmetry and group theory; molecular spectroscopy; and molecular interactions. The following is the link to the module for the course: Quantum Chemistry.

The topic of modern chemical bonds is also studied in the Computational Chemistry course that teaches the basics of programming in chemistry, chemical modelling, computation of various aspects of chemical behaviour with a geometric approach and also uses an ab-initio and semi-empirical electronic structure approach with the HF and HF methods. DFT (Density Functional Theory), and virtualization. This activity is supported by various freeware under ubuntu linux OS, such as: Gabedit, Avogadro, mpqc, siesta, gamess, orca, nwchem, gromacs. And CP2K.. The following is the link to the module for the course: Computational Chemistry.

UPC curriculum has provided courses that contain modern instrumental analytical courses, namely Spectroscopy and Chromatographic Methods, Electrochemistry Analysis courses in semester 5, and Practicum of Analytical Instruments courses in semester 6. All three are mandatory courses for UPC students. The materials in the Spectroscopy and Chromatographic Methods course are UV Vis spectroscopy, AAS, FTIR, NMR, MS, GC, and HPLC. The material in the Electrochemistry Analysis course is Analysis Potentiometry, Conductometry, Coulometry, Polarography, and voltammetry. The instrumentation practicum activities for the two courses were carried out in the Practicum of Analytical Instruments course. The following is the link to the module for the course: Spectroscopy and Chromatographic Methods: Practicum of Analytical Instruments; Electrochemistry Analysis.

UPB

Considering the importance of bioinformatics and genomics for Biology students, UPB will revise the curriculum by comprising those subjects. Bioinformatics will be offered as a new course (module handbook of Bioinformatics), while Genomics will be given as a sub-topics in the Genetics course (Genetics lesson plan). The course name will be renewed as Genetics and Genomics (Genetics and Genomic course module).

The students have different areas of interest, but to ensure the competence of graduates, UPB provides the core material for each sub-discipline of Biology in compulsory subjects. One of them is Microbiology. The course provides core material on bacteriology, mycology, and virology in addition to basic microbiology knowledge and techniques (link lesson plan). Students interested in pursuing a final project in Microbiology will be asked to take elective courses such as Bacteriology, Mycology, and Virology to strengthen their knowledge. Advanced materials will be given in these elective courses.

FEEDBACK 4:

Finally, the peers discuss with teachers and students what programming languages are offered. They learn that FMNS introduces students to “Python” in the computational courses, an open-source software, which offers a general-purpose approach to data sciences. The peers point out, that it would also be useful to give students the opportunity to get to know other programming languages and software tools such as “MATHLAB” and ”R”. “R” is also a free programming language for statistical calculations and graphics.

RESPONSE 4:

UPM

In UPM, some computer software such as Python, Mathlab, Maple, Geogebra, R, SPSS and Minitab have been taught to our students. Python, Mathlab, Maple, and Geogebra have been used for some courses like Differential Calculus, Integral Calculus, Multivariable Calculus, Numerical Methods, Digital Literacy, Programming Language, Mathematics

Computation, Data Structures and Algorithm, Introduction to Artificial Intelligence, and Database System. Meanwhile, some courses in statistics, such as statistics method, multivariate statistics, and probability and statistics use R, SPSS and Minitab.

UPB

UPB introduce various computer software for data analysis depends on the courses. For instance, Animal Systematics uses Bioedit, Clustal x, Mega X, DnaSp5, Haplotype Network 11 and NTSYS; Biostatistics and Biocomputer uses SPSS and will introduce MINITAB and R to the students; Plants Systematics also uses MINITAB, PAST, and NTSYS.

FEEDBACK 5:

However, according to the opinion of the peer group, the academic mobility of the students should be further promoted. The number of Bachelor's students who participate in international exchange programmes is still low despite students' high interest. National scholarships are available, but they are highly competitive, so only a few students receive them.

RESPONSE 5:

FMNS in 2022 have a program to increase the number of student mobility by 20% compared to 2021. In 2022, there are plans for students to take part in academic mobility activities which are explain below:

UPM

We couldn't agree more that we are still in low international academic mobility but since last two years, we are trying to improve the mobility not only for student but also for teaching staff. This year we have added some international activities by collaborating with overseas universities in credit transfer and sit-in programs. We also regularly motivate our

student to involve in several international mobility program provided by the Indonesia government, such as ICT (International Credit Transfer, see https://dikti.kemdikbud.go.id/pengumuman/pengumuman-program-transfer-kredit-internasional-2021/) and IISMA (Indonesian International Student Mobility Awards see: https://kampusmerdeka.kemdikbud.go.id/km/IISMA/landing.html).

We have also increased research funding for collaboration with overseas universities. This year we added two research collaborations with Universiti Teknologi Mara (UiTM) Malaysia.

UPP

We have increased research funding for collaboration with overseas universities. This year we have research collaborations with Universiti Teknologi Malaysia (UTM) Malaysia. Join research and publication with the Department of Physics, Universiti Teknologi Malaysia (UTM), represented by Dr. Ezza Syuhada Sazali (which was pioneered in 2022). With the research topic: "Fabrication of SiO2 Modified Graphene Membrane for Organic Waste Absorbent Applications". The Unesa Physics lecturers involved are: Prof. Dr. Munasir, S.Si., M.Sc.; Lydia Rohmawati, S.Si., M.Sc. and Dr. eng. Evi Suebah, M.Sc., M.Eng.

UPC

UPC plans international mobility activities in 2022 online and offline. UPC plans 2 students to Tarlac State University offline. UPC students will go to the Philippines to attend lectures there for some time. In addition, UPC plans international mobility online. The collaboration was carried out with Nottingham University, UK, so that UPC students could carry out international mobility for the School of Chemistry course.

UPB

FMNS committed to strive international mobility for both students and staff. In order to broaden the number of places for mobility, FMNS collaborates with the Office of International Affairs UNESA to seek opportunities both in partner universities and non-

partner universities as well as through personal contacts of lecturers. Presently, FMNS will discuss this opportunity with the University of Nottingham, United Kingdom.

FMNS also encourages students to take opportunities for international mobility through various programs such as the Indonesia International Student Mobility Awards (IISMA), International Credit Transfer Program, Nagoya University Program for Academic Exchange (NUPACE), IJEP Exchange Program of Kumamoto University Japan, and so forth. FMNS will provide support to increase student opportunities to get funding for these programs. In addition, FMNS will also encourage students and lecturers to apply for international mobility funding through various international organizations such as ERASMUS and DAAD as suggested by peers.

FEEDBACK 6:

The students confirm during the discussion with the peers that some opportunities for international academic mobility exist and that the credits acquired abroad are recognised at UNESA. However, they also point out that they wish for more places and better endowed scholarships for long- and short-term stays abroad. The number of available places in the exchange programmes is still limited and there are restrictions due to a lack of sufficient financial support. UNESA can provide only limited travel grants, while the demand from students is rising. The lack of financial support hinders students from joining the outbound programmes.

RESPONSE 6:

Study programs and FMNS provide funding to support academic mobility activities. Details of funds provided by study programs and FMNS are described in Table 2.12.

Table 2.12 Budget allocation provided by study programs for academic mobility

Study Program	**The amount of funding for academic mobility (in EUR)**	
	2021	**2022**
UPM	759.74	1,948.05

UPP	357.14	1,551.44
UPC	714.29	2,922.07
UPB	426.62	2,337.66

Funds for academic mobility are also provided by the faculty. In 2021 funds from FMNS for student mobility will be 3,636.36 EUR and in 2022 it will be 10,129.87 EUR.

FEEDBACK 7:

The peers understand these problems; however, they recommend increasing the effort to further internationalising UNESA by establishing more international co-operations and exchange programmes, and by offering more and better-endowed scholarships. In addition, the peers see that most of the faculty members have international contacts, which can be used for establishing more international co-operations.

The peers emphasize that it is very useful for students to spend some time abroad already during their Bachelor's studies to improve their English proficiency, to get to know other educational systems, and to enhance their job opportunities. Furthermore, FMNS should invite more visiting lecturers, initiate more international exchange programmes, and provide more scholarships for students.

RESPONSE 7:

FMNS plans to increase the number of international cooperation in 2022 as shown in Table 2.13.

Table 2.13 Plans for international cooperation activities in 2022

Study Program/ Faculty	**Institution**	**Form and number of collaboration**			
		Student Exchange	**Visiting Lecturer**	**Research Collaboration**	**Joint Publication**
UPM	1. Universiti Teknologi MARA, Malaysia	2	2	2	3
	2. University of ESSEX, UK	-	2	-	1

Study Program/ Faculty	Institution	Form and number of collaboration			
		Student Exchange	Visiting Lecturer	Research Collaboration	Joint Publication
	3. King Abdulaziz University	2	1	-	-
UPP	1. Universiti Teknologi Malaysia (UTM)	2	1	1	1
	2. University of Seville, Spain	-	-	1	1
	3. ITT Friction Technologies Pirelli, Italy	-	-	1	1
UPC	1. University of Nottingham, UK	-	2	1	2
	2. Universiti Teknologi MARA, Malaysia	2	1	-	-
	3. Tarlac Agricultural University, Philippines	2	1	-	-
	4. International Islamic University, Malaysia	-	1	-	-
UPB	1. University of Nottingham	10	-	-	-
	2. Universiti Teknologi MARA, Malaysia	2	-	-	-
	3. Technical University of Denmark, DTU	-	1	-	-
	4. Lee Kong Chian Natural History Museum, NUS	-	1	-	-
	5. Kyoto University	-	1	-	-
	6. The Islamic University of Gaza	-	-	1	-

Study Program/ Faculty	Institution	Form and number of collaboration			
		Student Exchange	Visiting Lecturer	Research Collaboration	Joint Publication
	7. Tropical Marine Science Institute, NUS	-	-	-	2
FMNS	1. University of Nottingham	-	1	-	-
	2. The University of Essex, United Kingdom	-	1	-	-
	3. Australian National University, Australia	-	1	-	-
	4. Tokyo Institute of Technology, Japan	-	1	-	-

FEEDBACK 8:

The peers point out that there can be no fixed conversion rate between CU and ECTS points, thus the ECTS points need to be determined and verified separately for each course. This can, e.g., be done by asking the students directly about the time they actually spend on each course. For this reason, it would be useful to include a respective question in the course questionnaires that are used for evaluating the quality of teaching and learning at the end of each semester. In any case, UNESA must make sure that the actual workload of the students and the awarded ECTS points correspond with each other.

RESPONSE 8:

In response to the feedback, the questions related to the students' actual workload in terms of the time they actually spend for each course have been added to the students' satisfaction survey which is available on the link https://gpm.fmipa.unesa.ac.id/index.php/angket-kepuasan-mahasiswa/. The survey results related to the students' actual workload are described below.

1. There are 94% (from 144 students) respondents state that 2 CU equal to 100 minutes face to face meeting, 120 minutes structured assignment, and 120 minutes self study activities.
2. There are 90% (from 144 students) respondents state that 3 CU equal to 150 minutes face to face meeting, 180 minutes structured assignment, and 180 minutes self study activities.

Based on these data the actual workload of the students and the awarded ECTS points correspond with each other.

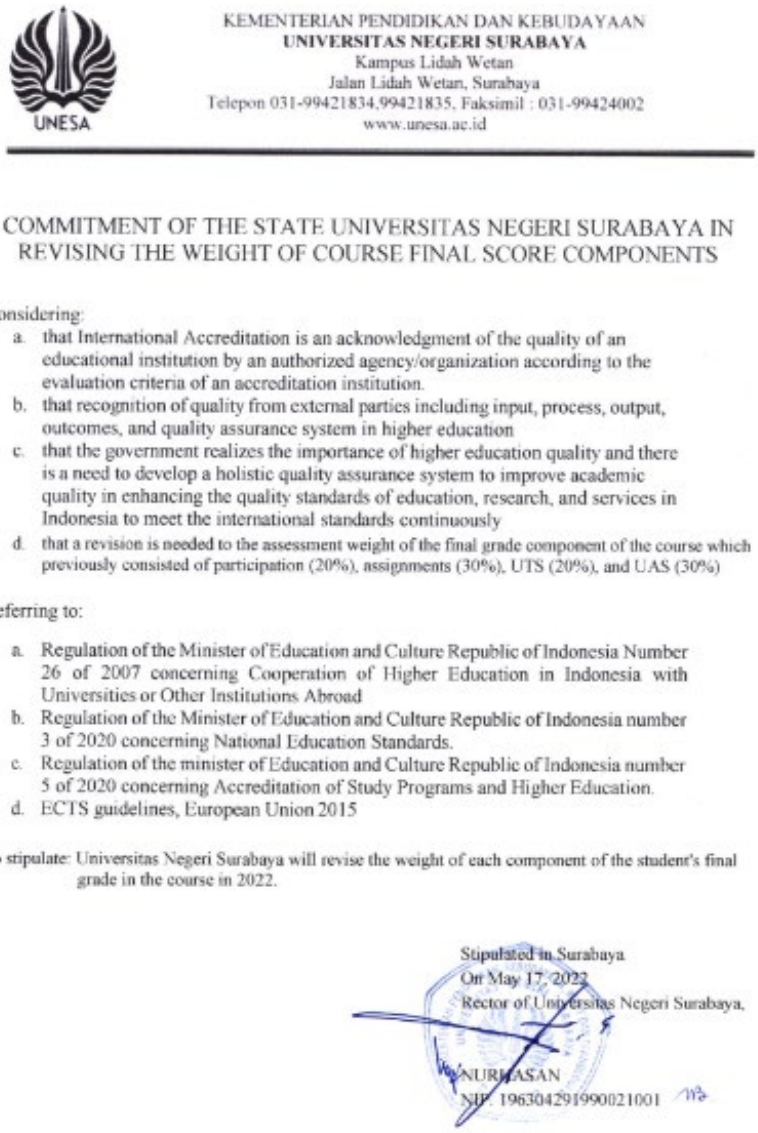
CRITERION 3 EXAMS: SYSTEM, CONCEPT AND ORGANISATION

FEEDBACK 1:

The peers discuss with the teachers during the audit how participation is assessed and why it contributes as much as 20 % to final grade. They learn that participation includes the students' activity in class, their responsiveness and reasoning as well as their frequency and quality of inquiries. UNESA provides a rubric, which all teachers use to assess students' participation. However, the teachers confirm that it is difficult to assess participation objectively and that "quiet" students are in a disadvantage here. Consequently, the peers suggest reducing the share of participation in the final grade.

RESPONSE 1:

By considering the feedback from ASIIN related to the percentage of class participation, Unesa has a commitment to review and revise the contribution of each assessment component on students' final grade. The details of the commitment is shown in Figure 3.1.



KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS NEGERI SURABAYA
Kampus Lidah Wetan
Jalan Lidah Wetan, Surabaya
Telepon 031-99421834,99421835, Faksimil : 031-99424002
www.unesa.ac.id

UNESA

COMMITMENT OF THE STATE UNIVERSITAS NEGERI SURABAYA IN REVISING THE WEIGHT OF COURSE FINAL SCORE COMPONENTS

Considering:

a. that International Accreditation is an acknowledgment of the quality of an educational institution by an authorized agency/organization according to the evaluation criteria of an accreditation institution.
b. that recognition of quality from external parties including input, process, output, outcomes, and quality assurance system in higher education
c. that the government realizes the importance of higher education quality and there is a need to develop a holistic quality assurance system to improve academic quality in enhancing the quality standards of education, research, and services in Indonesia to meet the international standards continuously
d. that a revision is needed to the assessment weight of the final grade component of the course which previously consisted of participation (20%), assignments (30%), UTS (20%), and UAS (30%)

Referring to:

a. Regulation of the Minister of Education and Culture Republic of Indonesia Number 26 of 2007 concerning Cooperation of Higher Education in Indonesia with Universities or Other Institutions Abroad
b. Regulation of the Minister of Education and Culture Republic of Indonesia number 3 of 2020 concerning National Education Standards.
c. Regulation of the minister of Education and Culture Republic of Indonesia number 5 of 2020 concerning Accreditation of Study Programs and Higher Education.
d. ECTS guidelines, European Union 2015

To stipulate: Universitas Negeri Surabaya will revise the weight of each component of the student's final grade in the course in 2022.

Stipulated in Surabaya
On May 17, 2022
Rector of Universitas Negeri Surabaya,

NURHASAN
NIP. 196304291990021001

Figure 3.1 Capture of Unesa Commitment Letter related to Components of Students' Final Grade

FEEDBACK 2:

The peers inspect a sample of final theses and have some doubts concerning the scientific demand and quality of the Bachelor's theses. Not all theses shown to the peers correspond to common scientific standards, as would have been expected based on the project de-

scription. The auditors consider scientific working standards, ethics in science, and concepts of writing scientific publications essential for graduating from a scientific study programme.

In order to meet international standards, the peers expect UNESA to reconsider the scientific depth and documentation of the theses. Students need to be better prepared to write scientific papers. This could be incorporated in the course "Research Methodology", which the students of all four programmes under review have to take in their fifth semester. Setting international standards will be the key for students to continue their academic education, particularly abroad, and will support graduates in finding a science-related job in the private sector or at universities. An appropriate scope and academic quality of the thesis must also be guaranteed in order to follow the vision of UNESA to become a nationally recognised research university.

RESPONSE 2:

UPM

UPM provides several courses to assist student's thesis in terms of mathematics content and scientific writing such as academic writing, seminar, and experiment design. Before the student's thesis is published, UPM provides regulation to guarantee its quality. For instance, students need to present and discuss the thesis manuscript to their supervisor and peers. Afterwards, UPM assigns thesis examiner to assess and give suggestions for better thesis writing.

several student's international publication:

1. https://iopscience.iop.org/article/10.1088/1742-6596/1417/1/012010/pdf
2. https://iopscience.iop.org/article/10.1088/1742-6596/1417/1/012013/pdf
3. https://ieeexplore.ieee.org/document/9502253
4. https://iopscience.iop.org/article/10.1088/1742-6596/947/1/012003/pdf

UPP

UPP has three compulsory courses essential for the students to finish their study programme, namely Research Methodology, Colloquium, and Thesis. These three courses purpose to prepare students for better Physics Literacy, academic writing, and research in the

Physics field of study. Overcoming the challenge of setting the thesis to meet the International standard, UPP has planned a strategy regarding the scientific depth and documentation. First of all, regarding Physics Literacy, the references used in these three courses are retrieved from Indonesian and international journals. Second, in improving academic writing, students also are given guidance and the opportunity to write articles published in Physics Journals both in Indonesian and English. Regarding research, despite providing supervisory activities for the students, UPP also allows them to do research in collaboration with their pairs and the UPP's Lecturers. In this case, students act as research assistants and get experience in conducting collaboration research in a specific area. The examples of UPP's students' article published in IOP-Journal of Physics Conference Series are listed below:

1. https://iopscience.iop.org/article/10.1088/1742-6596/1491/1/012059/meta
2. https://iopscience.iop.org/article/10.1088/1742-6596/1491/1/012050/meta
3. https://iopscience.iop.org/article/10.1088/1757-899X/1125/1/012001/pdf
4. https://iopscience.iop.org/article/10.1088/1742-6596/2110/1/012013/pdf

UPC

Scientific working standards, ethics in science, and concepts of writing scientific publications are introduced through the literature of chemistry course. Students are also asked to compile scientific papers by paying attention to scientific writing, how to cite scientific sources, and bibliography as a form of scientific accountability. This introduction is strengthened in research methodology courses, seminars, and theses.

To better prepare for scientific publications, UPC provides training on writing scientific articles on a regular basis by the journal team at UPC. Activities to introduce scientific working standards and ethics in science are also carried out in practicum courses. After completing the practicum, students compile a practicum report consisting of writing the title, background, theory, work steps, writing experimental data, conducting analysis, drawing conclusions, and writing a bibliography. The following is an example of an article written by a student and published in an international journal: publication 1; publication 2.

UPB

UPB seeks to strengthen student competence in scientific work, ethics in science, and the concept of writing scientific publications which are included in several compulsory courses, for example Biostatistics and Biocomputers, Biological Research Methodology, Seminars, several Compulsory Courses and Project-Based Electives. Biostatistics and Biocomputer courses provide reinforcement for students to be able to choose and determine the type of research that will be carried out in support of final project research, techniques for taking data, processing and analysing data using computer-based software. Biology Research Methodology courses and Seminars strengthen students' abilities in designing and carrying out research, compiling research reports and publishing in seminars orally as well as posters, as well as in the form of articles. Biology Research Methodology course provides reinforcement for students in scientific work, starting from how to determine research topics, compiling background descriptions containing empirical and theoretical studies according to research topics, formulating research problem formulations, formulating research objectives, formulating research benefits, reviewing sources references in the form of literature review and learn how to cite and organise reference sources using software such as Mendeley, develop a research framework, determine research types, determine research variables, develop research designs, develop research procedures, compile data analysis, describe a discussion of research results, and organise references in the bibliography with various models.

Strengthening ethics in science and the concept of writing scientific publications is mainly trained in Seminar courses as well as several project-based compulsory and elective courses/project based learning (PjBL). In Seminar courses, students get reinforcement on how to do scientific publications in the form of articles, oral presentations, or in the form of posters. Students are taught and directly practise reviewing articles, compiling articles, making posters, conducting research proposal seminars, and being trained on how to communicate scientifically correctly in accordance with scientific ethics.

Several compulsory and elective courses apply project-based learning where the output is in the form of scientific articles worthy of publication in national or international

seminars and journals, such as in the subjects: Animal Systematics, Molecular Biology Analysis Techniques, Biotechnology, Entomology, Protozoology, Malacology, Ornithology, Phytohormones, Ecotoxicology, Applied Genetics. In project-based courses, students in groups are given tasks in the form of a research project, which is preceded by the preparation of a draft proposal, conducting a research project in accordance with a proposal approved by the lecturer, organising data, analysing data, compiling articles based on research data in accordance with article standards for national or international publications, and try to be published by being submitted in national or international journals, or published in national or international seminars. Table 3.1 below presents several publications from students' assignments.

Table 3.1 Students' publication from various courses

No.	Title	Journal	Course
1.	Emodin from Rhubarb (*Rheum officinale* Baill.) as An Antiviral against SARS-CoV-2 via Inhibitor Pathway: An In Silico Study (pdf)	Teikyou Medical Journal Vol. 45 No. 01, 2022	Technique of Molecular Biology Analysis
2.	Identifikasi Jenis Ikan Mudskipper di Pantai Surabaya dan Sidoarjo (*Identification of Mudskipper Fish Species in Surabaya and Sidoarjo Beaches*) (pdf)	Biotropika: Journal of Tropical Biology Vol. 07 No. 03, 2019	Animal Systematics
3.	Kebiasaan Makan Ikan Gelodok (family: Gobiidae) Lokal Jawa Timur (*The Habit of Mudskipper Fish (Gobiidae) Consumption in East Java Locale*) (pdf)	Jurnal Biologi Udayana Vol. 24 No. 01, 2019	Animal Systematics
4.	Keanekaragaman dan Kelimpahan Capung (Odonata: Anisoptera) di Lapangan Watu Gajah Tuban (*Diversity and Abundance of Dragonflies (Odonata: Anisoptera) in Watu Gajah Tuban Field*) (pdf)	Bio Sains: Jurnal Ilmiah Biologi Vol. 1, No. 02, 2022	Animal Systematics

In addition, the students' of UPB are published their final thesis in peer-reviewed journals, for example in Nationally Accredited Journals, namely LenteraBio https://journal.unesa.ac.id/index.php/lenterabio . UPB also encourages the students to publish their thesis in international peer reviewed journals (Tabel 3.2).

Table 3.2 Students' publication in international peer reviewed journals

No.	Title	Authors	Year	Journals
1.	The Effect of Gibberellin Extracted from *Eichhornia crassipes* Root on the Viability and Duration of Hard Seed Germination	K Ummah and Y S Rahayu	2019	J. Phys.: Conf. Ser. 1417 012037 https://iopscience.iop.org/article/10.1088/1742-6596/1417/1/012037/meta
2.	The Effect of Local Micro Organism and Mycorrhizal Fungi on Anatomical and Morphological Responses of Red Chili (*Capsicum annuum* L.) at Different Soil Water Level	T N Naafi and Y S Rahayu	2019	J. Phys.: Conf. Ser. 1417 012036 https://iopscience.iop.org/article/10.1088/1742-6596/1417/1/012036/meta
3.	Bird diversity of resort Ranu Darungan, Bromo Tengger Semeru National Park, Indonesia	Boni Herdiawan, Reni Ambarwati, and Toni Artaka	2020	Eco. Env. & Cons. https://iopscience.iop.org/article/10.1088/1742-6596/1417/1/012036/meta
4.	The Diversity of Tolerant Fish in the Coastal Waters of Lusi Island Sidoarjo Regency	A A Fachrudiana and F Rachmadiarti	2021	J. Phys.: Conf. Ser. 1899 012026 https://iopscience.iop.org/article/10.1088/1742-6596/1899/1/012026/pdf
5.	Genetic identification of *Clithon oualaniense*	Anisya E. Juniar, Reni	2021	AACL Bioflux http://www.bioflux.com.ro/docs/2021.1046-1056.pdf

No.	Title	Authors	Year	Journals
	(Gastropoda: Neritidae) from Madura, Indonesia	Ambarwati, Dwi A. Rahayu		
6.	Molecular characteristics of *Donax faba* (Bivalvia: Donacidae) from Nepa Beach, Madura, based on cytochrome oxidase subunit I gene sequences	Suci Y. P. Sari, Reni Ambarwati, Dwi A. Rahayu	2021	AACL Bioflux http://www.bioflux.com.ro/docs/2021.2416-2426.pdf
7.	*Jatropha integerrima*, *Duranta erecta* and *Hibiscus rosa-sinensis* as Potential Lead Absorbent from Polluted Air in Dense Traffic Area	Mastuti, Y.A., Rachmadiarti, F.	2021	Asian Journal of Water, Environment and Pollution 18(4), pp. 95–100 https://content.iospress.com/articles/asian-journal-of-water-environment-and-pollution/ajw210048

FEEDBACK 3:

With respect to the final grades, the peers notice that the share of students with excellent grades is very high in some courses. They point out that it would be useful to make full use of the grading scale.

RESPONSE 3:

The same grading scale of 0-100 is used to all courses in the four study programs. The conversion of the score is shown in Table 3.3.

Table 3.3 Score Conversion

Score Interval	Score	Grade	Category
85≤ A ≤100	4	A	Excellent
80≤ A- <85	3.75	A-	Excellent

Score Interval	Score	Grade	Category
75≤ B+ <80	3.5	B+	Good
70≤ B <75	3	B	Good
65≤ B- <70	2.75	B-	Satisfied
60≤ C+ <65	2.5	C+	Satisfied
55≤ C <60	2	C	Satisfied
40≤ D <55	1	D	Failed
0≤ E <40	0	E	Failed

CRITERION 4 RESOURCES

FEEDBACK 1:

In general, the percentage of teachers with a doctoral degree at FMNS (57 %) is rather low compared to international standards. The peers learn that several staff members are currently pursuing their doctoral studies at either international or at Indonesian universities. The peers support these efforts and strongly encourage FMNS to further increase the percentage of teachers with a PhD, either by hiring only new staff members that already have a doctoral degree or by requiring more Master's degree holders to pursue doctoral studies. If UNESA wants to achieve its goal of becoming a nationally recognised research university, the spending on research and teaching, the number of publications in renowned international journals, and the share of teachers with a PhD degree should be significantly increased.

While analysing the staff handbooks, the peers notice that most of the staff members are also graduates from UNESA. Thus, they also recommend hiring new staff members that graduated from other universities.

RESPONSE 1:

FMNS has several efforts to increase the number of staff with a Doctoral Degree. The current number and projection of faculty members with a Doctoral Degree through formal education or recruitment are presented in Table 4.1.

Table 4.1 Staff Development of Doctoral Degree

Criteria	Study Program	2021	2022	2023
Number of Staff with Doctoral Degree	UPM	22	24	26
	UPP	13	16	22
	UPC	23	25	27
	UPB	19	20	23
Number of Staff undergoing Doctoral degree	UPM	3	5	6
	UPP	5	5	4
	UPC	6	5	7
	UPB	5	4	2
Number of Recruited Staff with Doctoral degree	UPM	6	2	1
	UPP	3	5	3
	UPC	1	2	1
	UPB	0	1	1

In 2022, Unesa is conducting teaching staff recruitment with doctoral qualification. The recruitment announcement is published nationally through the Unesa website: https://unesa.ac.id/pengumuman/452/pengumuman-seleksi-penerimaan-dtn-dan-tktt-non-pns-unesa-2022.

FEEDBACK 2:

The peers notice that the research output of the academic staff members could be improved, especially concerning publications in renowned international journals. Since research activities carried out by the teaching staff should contribute to the content of the courses and students should be familiarized with independent academic research, it is important to increase the research output in science (biology, chemistry, mathematics, and physics). To reach international visibility, the amount of papers published in internationally peer-reviewed journals should be increased. In addition, the existing research activities

should be made more visible (e.g., by publishing them on the English webpage of the respective degree programme).

RESPONSE 2:

Research activity and publication of teaching staff in each study program are shown in the webpage written in Table 4.2.

Table 4.2 Link Website of Teaching Staff

Study Program	Link Website
UPM	https://s1-matematika.fmipa.unesa.ac.id/page/staff-handbook
UPP	https://s1-fisika.fmipa.unesa.ac.id/page/lecturer-profile
UPC	https://s1-kimia.fmipa.unesa.ac.id/page/lecturer-profile
UPB	https://s1-biologi.fmipa.unesa.ac.id/page/academic-staff

Each study program's efforts to increase the number of research activities and publications are described below.

UPM

The teaching staffs of UPM publish their research outputs in internationally peer-reviewed journals. Up to the middle of May 2022, there are 7 articles on the process of publication in various of internationally peer-reviewed journals (Table 4.3). UPM encourages and supports the teaching staffs to conduct researches by providing facilities as well as enough time. In addition, Unesa also provide more funding allocation for research, hence the teaching staff will get more opportunities to improve the research quality. In 2022, there are ten research projects conducted by the teaching staff in each research group (Table 4.4).

Table 4.3 Publication of UPM Year 2022 (On going)

No.	Authors	Tittle	Status	Journal Tittle
1.	Budi Rahadjeng, Dwi Nur Yuni-anti, Raden Sulaiman, Agung Lukito	Spectrum of Unicyclic Graph	Published	Atlantis Press
2.	R Artiono, A Wintarti, BP Prawoto, YP As-tuti	Co-infection model for Covid-19 and Rubella with vaccination treatment: sta-bility and threshold	Published	Commun. Math. Biol. Neurosci. 2022, Article ID 8
3.	KN Khikmah, A Sofro	Autoregressive Moving Av-erage and Generalized Au-toregresive Moving Aver-age in Covid-19 Confirmed Cases in Indonesia	Publish	arXiv preprint ar-Xiv:2202.11794
4.	EM Imah, IK Lak-sono, K Karisma, A Wintarti	Detecting violent scenes in movies using Gated Recur-rent Units and Discrete Wavelet Transform	Publish	Register: Jurnal Il-miah Teknologi Sis-tem Informasi 8 (2), 94-103
5.	DV Ariani, D Juni-ati	klasifikasi Penyakit Paru Berdasar Suara Pernapasan Menggunakan Dimensi Fraktal Higuchi dan K-Near-est Neighbor	Publish	Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika 5 (1), 70-81
6.	D Juniati, AE Su-wanda	klasifikasi Penyakit Mata Berdasarkan Citra Fundus Retina Menggunakan Di-mensi Fraktal Box Counting dan Fuzzy K-Means	Publish	Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika 5 (1), 10-18

No.	Authors	Tittle	Status	Journal Tittle
7.	Manuharawati, Dian Savitri, M Jakfar	New Refinements for Integral and Sum Forms of Generalized Hölder Inequality for N Term	In Review	Australian Journal of Mathematical Analysis and Applications
8.	R. Sulaiman, Ayunun Sofro, Dwi Nur Yunianti, Rudianto Artiono	An Application of Weighted Similarity on Intuitionistic Fuzzy Soft Matrices in Medical Diagnostics	Published	International Journal of Mathematics and Compuetr Sciences Vol 17. N0 3. 2022

Table 4.4 Research Project of UPM Year 2022 (On going)

No.	Project Tittle
1.	Orthogonal Additif Functional in Cesaro Sequence Spaces
2.	New Norms induced by Inner Products on Morrey Sequence Spaces
3.	Dynamic Analysis of Leptospirosis Spread Model Based on Machine Learning (Case Study of Indonesia and Malaysia)
4.	Development of Counter Intuitive test Problem for Getting Smooth IFS Similarity Measurement.

UPP

The research project and publication are shown in Table 4.5 and 4.6.

Table 4.5 UPP's Research Project at 2022 (On going)

No.	Judul Penelitian
1.	Characteristics of Polyaniline/Metal Oxide Composites as Liquefied Petroleum Gas (LPG) Sensor Materials
2.	The Effectiveness of Polyvinyl Alcohol (PVA) Nanofibers as Antimicrobial Ingredients in Wound Dressing
3.	SiO_2 Modified Graphene Membrane Fabrication: For Organic Waste Absorbing Applications

No.	Judul Penelitian
4.	NPS-Based Nanocomposites for Lithium-Ion Battery Electrode Applications
5.	Synthesis of New Antibacterial Bio-Material Agent: ZnO Nanoparticles from Pineapple Peel
6.	Zeolite Modified Fe_3O_4/SiO_2 Core Shell Nano-carrier as Curcumin Storage Capacity: pH responsive Encapsulation and Release Controlled Release
7.	Tulungagung Sand TiO_2 Based Teeth Whitening Gel Formulation
8.	Analysis of the Gravity Anomaly of Mount Semeru Post Eruption 4 December 2021
9.	Analysis of the feasibility of water for daily consumption based on PH and TDS content using sensors
10.	Dielectric Resonator Oscillator (DRO) Module Design Using Dielectric Components Based On Magnesium Tetanate For Radar System Applications

Table 4.6. Publication of UPP Year 2022 (On going)

No.	Author	Title	Status	Journal
1.	L. Rohmawati, Istiqomah, A. A. Pratama, W. Setyarsih, N.P. Putri, Munasir, Darminto	The Characteristics of TiO_2 Anatase from Tulungagung Sand as an Antibacterial Material	in review	Nanosystems: physics, chemistry, mathematics
2.	Lydia Rohmawati, Ajeng Hefdea, Woro Setyarsih, Munasir, Nugrahani Primary Putri, Diah Hari Kusumawati and Darminto	Characteristics of Fe_3O_4 Nanoparticles From Natural Sand and Their Antibacterial Activity	in review	SUT Journal

No.	Author	Title	Status	Journal
3.	Lydia Rohmawati, Setya Permata Sholicha, Istiqomah, Woro Setyarsih, Munasir and Darminto	Dolomite Characteristic from Natural Material and Its Application as an Antibacterial	Publish	Science and Technology Asia
4.	Prof. Dr. Munasir, M.Si. Ambarwati Teraningtyas , Diah Hari Kusumawati Zainul Arifin Imam Supardi	Nanosized Fe_3O_4/SiO_2 core shell fabricated from natural sands, magnetic properties, and their application for dye adsorption	Publish	Engineering and Applied Science Research
5.	Frida U. Ermawati, Zainul A. I. Supardi, Dzulkiflih, and Arie Realita	Characteristics of (Mg0.5Zn0.5)(Ti0.98Sn0.02)O3 Ceramics as a microwave dielectric resonator material	Accepted	AIP Publishing
6.	Munasir, M. S. Rizal	The composite material of GO-Fe3O4 from coconut shell graphite for application of color degradation in water	In review	Chiang Mai Journal Natural Science
7.	Madlazim, Eko Hariyono, dan M. N. Fahmi	Tsunami faulting model analysis for the 30 October 2020 normal earthquake occurred in Izmir-Turkey	Publish	Science of Tsunami Hazard

No.	Author	Title	Status	Journal
8.	Madlazim, Binar Kurnia Prahani	Development of research roadmap of the excellent field of science Unesa: Tsunami science	Publish	Science of Tsunami Hazard
9.	Madlazim, Eko-Hariyono	Tsunami mitigation–online learning effectiveness by using ombak learning model	Publish	Science of Tsunami Hazard
10.	Madlazim, Tjipto Prastowo, M. N. Fahmi.	Tsunami from strike-slip and normal earthquake and its relation with the product of dominant period and duration of more than 50 second of earthquake p-wave	Publish	Science of Tsunami Hazard
11.	Munasir	Fabrication of New Fe3O4/PVA/(C6H7O6Na)n nanohybrid ferrogels for antibacterial applications	Publish	Materials Research

UPC

UPC made improvements regarding the lecturer publications produced. One of them is by developing research conducted in 2022. The following is a list of research conducted by UPC in 2022 (Table 4.7).

Table 4.7 Research Project of UPC Year 2022 (On going)

No.	Project Title
1.	Green Synthesis of ZnO/TiO2 Nanocomposite with Chitosan Modified Plant Extract and Its Application as Antibacterial Agent and Photocatalyst
2.	Natural Photosensitizer UV-Vis Spectrum Grading for Optimization of Light Harvest and Eco-Friendly Efficiency Dyes Sensitized Solar Cell
3.	Dopping Modifier Layered Double Hydroxide/Graphene Oxide, Quaternized Graphene Oxide, Polyvinyl Pyrrolidone for Prevention of Pore Defects and Extreme Fouling/Biofouling Defects in Polyvinylidene Fluoride Membranes
4.	Study of the Potential of New Chromophores for Optoelectronic Optimization in Solar Cell Development
5.	Alpha-Glucosidase Inhibition Activity and Production of Short-Chain Fatty Acids of Fermented Garlic Single Pikel Lactobacillus Plantarum B1765 as Antidiabetic Functional Food
6.	Utilization of Chicken Egg Shells and Rice Husk as Catalysts for Biodiesel Production from Cooking Oil
7.	Applications Using Indian Shallot Extract as Vegetable Plant Growth Supplement
8.	Standardization of Production of Ethanol-Based Hand Sanitizer (HSBE) made from local commodities and lignocellulosic waste to reduce the potential for counterfeiting in the prevention of Covid-19 transmission
9.	Nanoencapsulation of Yeast-Black Rice Extract as an Anti-Diabetes Mellitus Type 2 Preparation (Covid-19 Co-Disorder)
10.	Application of Hydroxyapatite Silver Fluoride Chitosan Nanomaterial Technology for Reconstruction of Fractured Teeth
11.	Looking for the Optimum Composition of Secang (*Caesalpinia Sappan* L.) and Red Ginger (*Zingiber Ofale* Roxb.) Extracts which are Effective as Anti-Arthritis Agents

Meanwhile, the latest publication conducted in 2022 has been identified by UPC in addition to several publications that are still being carried out and are in the review process (Table 4.8).

Table 4.8 Publication of UPC Year 2022 (On going)

No.	Author	Title	Status	Journal
1.	Sari Edi Cahyaningrum, Amaria, Fitriari Izzatunnisa Muhaimin	The Kinetic Release and In-Vivo Study of Alginate-Chitosan Encapsulated Metmorfin Against Type II Diabetes Mellitus	Published	RASAYAN J. Chem. 15(2): 1040-1044
2.	Suyatno, Amaria, IGM Sanjaya, Rusly Hidayah, Devy P. Sari, Nabella Dwitarani, Farida D. Oktavia, Nurrul hidayah A. Fadzlillah	Synthesis of Nano herbal from Ethanol Extract of Indonesian Fern *Selaginella plana* and Antibacterial Activity Assay	Published	Tropical Journal of Natural Product Research. 6(1): 44-49

UPB

The teaching staffs of UPB publish their research outputs in internationally peer-reviewed journals. Up to the middle of May 2022, there are 13 articles on the process of publication in various of internationally peer-reviewed journals (Table 4.9). UPB encourages and supports the teaching staffs to conduct researches by providing facilities as well as enough time. In addition, Unesa also provide more funding allocation for research, hence the teaching staff will get more opportunities to improve the research quality. In 2022, there are ten research projects conducted by the teaching staff in each research group (Table 4.10).

Table 4.9 Publication of UPB Year 2022 (On going)

No.	Authors	Tittle	Status	Journal Tittle
1.	Pungky Slamet WK, Dyah Hariani, Ahmad Taufiq Mukti	Evaluation of Probiotic-Fermented Feed Addition and Laser-Firing to Accelerate Mature Broodstocks and Seed Productions of African Catfish (*Clarias gariepinus*)	Published	Turkish Journal of Fisheries and Aquatic Sciences. 22(2): 1-9. https://www.trjfas.org/abstract.php?id=14875
2.	Koh Siang Tan, Samuel Hui Ming Tan, Kitithorn Sanpanich, Teerapong Duangdee, Reni Ambarwati	Xenostrobus or Vignadula (Bivalvia: Mytilidae)? A taxonomic re-evaluation of small black mussels inhabiting the upper intertidal zone of the estuaries of Southeast Asia	Published	Zoological Journal of the Linnean Society https://academic.oup.com/zoolinnean/advance-article-abstract/doi/10.1093/zoolinnean/zlac031/6585914?redirectedFrom=fulltext
3.	Yuliani	Biopesticidal Effects of *Elephantopus scaber* Linn. Methanol Extracts against Target and Non-Target Organisms and the Soil Microbial Community	Accepted	Revista de Ciencias Agroveterinarias
4.	Nella Yulia Sari and Fida Rachmadiarti	Potency of *Jatropha integerrima* Jacq, *Hibiscus rosasinensis* L. and *Ruellia tweediana* as Absorbants of Lead (Pb) in the Air	Accepted	Nature Environment and Pollution Technology
5.	Nurul Laily, Reni Ambarwati, Dwi A. Rahayu, Nur R. Isnaningsih	Communities Structure of Gastropods in Mangrove Area of Kutang Beach, Lamongan Indonesia	Accepted	AACL Bioflux
6.	Fida Rachmadiarti,	Analyzing the Efficacy of *Sal-*	Accepted	Nature Environ-

No.	Authors	Tittle	Status	Journal Tittle
	Guntur Trimulyono, W. H. Utomo	*vinia molesta* Mitchell as Phytoremediation Agent for Lead (Pb)		ment and Pollution Technology
7.	Ajeng Ramadhani, Reni Ambarwati, Ragil Satriyo Gumilang	Diversity and Abundance of Water Birds in the Mangrove Area of South Coast of Bangkalan, Madura	Revision	Biodiversitas
8.	Yuni Sri Rahayu, Yuliani, Husam Al-Najar	The Role of Mycorrhizae Fungi and Phosphate-Solubilizing Bacteria on Plant Survival Grown on Heavy Metal Contaminated Soil	Revision	Revista Chapingo, Serie Horticultura
9.	Dyah Hariani	The Morphometric Studies the Gonad Maturity of Male Catfish Broodstock Caused by Laserpuncture	In Review	Egyptian Journal of Aquatic Biology and Fisheries
10.	V.N. Vatmawati and F. Rachmadiarti	Effect Phytoremediation of *Eichornia crassipes* (Mart.) Solms and *Marsilea crenata* C.Persl on Reduction of Phosphate Lavels in Laundry Waste	In Review	Asian Journal of Water, Environment and Pollution
11.	Kandilia Sahani, Fida Rachmadiarti	The Ability of *Dracaena marginata* var. tricolor, *Gratophyllum pictum*, and *Pedilanthus tithymaloides* as Lead Absorbents in the Air	In Review	Pollution
12.	Viola Atlanta, Reni Ambarwati, Dwi Anggorowati Rahayu, Nova Mujiono	Diversity of Bivalvia in the North Coast of Lamongan, Indonesia	Submit	Biodiversitas

No.	Authors	Tittle	Status	Journal Tittle
13.	Christiaan Warner Hoornenborg, Nur Qomariyah, Janine Kruit, Herson Antonio González-Ponce, André Petrus van Beek , Han Moshage and Gertjan van Dijk	*Sansevieria trifasciata* protects pancreatic-beta cells via the Nf-κB pathway.	Submit	Nutrients

Table 4.10 Research Project of UPB Year 2022 (On going)

No.	Project Tittle
1.	Variations in Morphology and Genetic Diversity of Uceng (*Nemacheilus* sp.) Local Blitar Regency
2.	De-astringency of Persimmon (*Diospyros kaki* L.) with Alcohol Treatment and KOH Application
3.	In-silico Test of Bioavailability and Inhibition of NF-κB Metabolite Activity of Extracts of Mangrove leaves, Banyan Leaves, and Gooseberry Leaves.
4.	Analysis of Water Quality and Biosafety of Mangrove Biota at Bancaran Beach Bangkalan Madura
5.	Screening and Characterization of Polycaprolactone Degrading Bacteria from Wonorejo Mangrove Soil
6.	Administration of Vitamin E and Laserpuncture Induction to Improve the Quality and Quantity of Rat Spermatozoa
7.	Induction of Gonad Maturity Level Female Sand Lobster (*Panulirw homarus*) with Shortwave Radiation Beams (Laserpuncture)
8.	DNA Barcoding of *Meretrix* sp. (Bivalves: Veneridae) from Bancaran Madura
9.	Diversity of Indigenous Bacteria in Fermethod: Fermented Feed Mixed Water Hyacinth, Corn Cobs and Bran as a Source of Cellulase Enzymes to Accelerate the Fermentation Process of Cellulosic Materials

No.	Project Tittle
10.	Implementation of Tapak Liman (*Elephantopus scaber*) Biopesticide Formula to Improve Agroecosystem Quality
11.	Diversity of Phyllosphere Bacteria on Yellow Tabebuia Leaves in Surabaya

FEEDBACK 3:

The provided budget allows the departments to conduct the study programmes as well as some specific activities, including student exchange programmes, student financial assistance for research, and participation in international conferences. The peers point out that the spending on research and teaching activities is rather low by international standards. Since UNESA has the goal to become a nationally recognised research university, it would be necessary to significantly increase (e.g., doubled) the investment in research.

RESPONSE 3:

Unesa has a commitment to increase the investment in research. Vice Rector for General Affairs and Finance stated that the total research funds in 2022 is 413,891.68 EUR. The number increases 103.01% compared to research funds in 2021 (203,880.00 EUR). The statement Letter can be seen in Figure 4.1.

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS NEGERI SURABAYA
Kampus Lidah Wetan, Jalan Kampus Lidah Unesa, Surabaya 60213
Telepon: +6231- 99421834,99421835, Faksimil : +6231- 99424002
Laman : www.unesa.ac.id, E-mail : rektor@unesa.ac.id

STATEMENT LETTER
Nomor : B/27976/UN38.II/TU.00/2022

I, the undersigned, are
Name : Suprapto, S.Pd., M.T.
Position : Vice Rector for General Affairs and Finance, Universitas Negeri Surabaya
Stating that, in 2022 there is higher total research funds than in 2021

2021	2022	% increasing
€ 203,880.00	€ 413,891.68	103.01%

The research fund for FMNS in 2022 is € 413,891.68 that is higher than in 2021 (€ 203,880.00)

Surabaya 17 May, 2022
Vice Rector for General Affairs and Finance
Universitas Negeri Surabaya,

Suprapto, S.Pd., M.T.
NIP 196904021994030001

Figure 4.1 Statement Letter of Research Funds

FEEDBACK 4:

However, the peers see that usually students do the experiments together in groups of three to five students (depending on the course). Since it is very important for students to gain sufficient practical experience in laboratory work, the peers expect UNESA to provide enough instruments and laboratory space so that the experiments can be conducted by groups of not more than two to three students. Otherwise, students may not acquire the necessary hands-on experience in conducting experiments and carrying out practical laboratory work.

RESPONSE 4:

UPM

UPM laboratory already provides 1 Personal Computer (PC) for 1 student therefore it shows sufficient instruments for computational practicum. UPM laboratory accommodates more than 40 PCs so that it is available for all students in a class to conduct laboratory activities.

UPP

Services for both learning and research activities can be improved with the availability of adequate laboratory equipment. Every year, laboratory equipment is procured to meet the laboratory's needs. The tools available in learning laboratories such as the basic electronics laboratory are available, one of which is an Audio Frequency Generator with as many as 20 pieces and consumables such as resistors, diodes, capacitors, and IC regulators with 500 pieces each. With the equipment mentioned above, students can use the equipment for the purposes of Basic Electronics and advanced electronics courses. With a total of 20 AFGs, it can be used for 60 students, so the ratio of tool use to students is around 1:3.

UPC

Practicum at UPC is given to all students, each practicum group contains about 2-3 students. To ensure that every student has the same opportunity to improve their skills in the laboratory, each group only consists of 2-3 people, so that in 1 class, the implementation of the practicum will include 10 groups. If then a practicum course, such as a chemical instrument practicum, has 2 credits unit, then each group will have at least 30 minutes to operate the instrument. Thus, each student will have 10-15 minutes to operate the instrument. Meanwhile, sample preparation that must be done before the practice of sample analysis is using instruments is carried out at the previous meeting.

Furthermore, every year UPC also continues to budget a number of funds to increase the availability of materials, equipment and instruments in the laboratory in order to further improve the quality of knowledge and laboratory skills of each student in the future.

UPB

To ensure quality of service to students, it is very important for students to get the optimal opportunity to use laboratory equipment, especially in practicum and other laboratory work activities. UPB has several laboratory equipment that can be used by students to research and conduct experiments, for example the use of a microscope for 4 courses (microbiology, structure and development, ecology, taxonomy) as many as 80 microscopes are available to be used in UPB. As many as 58 microscopes can be used for 132 students, thus it meets the need of 1:2.3 students ratio for each microscope.

CRITERION 5 TRANSPARENCY AND DOCUMENTATION

FEEDBACK 1:

However, the information about the teaching format in the module description should be updated; it is not always clear what course is a lecture and what course includes laboratory work. The module descriptions need to make transparent how many hours students spend in the laboratory in each course and what laboratory work is done. In addition, the literature references should be updated.

RESPONSE 1:

The update of the module description includes details on time periods students spend in the laboratory in each course and topics of laboratory work is done has been mentioned in the workload in Figure 5.1.

MODULE HANDBOOK

Module Name	Quantitative Chemical Analysis
Module level	Bachelor
Abbreviation, if applicable	3074213028
Sub-heading, if applicable	-
Course included in the module, if applicable	-
Semester/term	3rd/Second Year
Module coordinator(s)	Dr. Pirim Setiarso, M.Si
Lecturer(s)	Prof. Dr. Sri Poedjiastoeti, M.Si Prof. Dr. Nita Kusumawati, M.Sc Dr. Pirim Setiarso, M.Si Rusmini S.Pd., M.Si
Language	Indonesian
Classification within the curriculum	Compulsory/ ~~Elective~~
Teaching format/class hours per week during the semester:	3 contact hours of lectures and lab activity (Indonesia credit semester or sks*)
Workload:	a. Lecture: 2 x 50 minutes lectures, 2 x 60 minutes structured activity, 2 x 60 minutes individual activity, 14 weeks per semester, 79.33 total hours per semester ~ 3.18 ECTS b. Lab activity: 1x170 minutes lab activity, 14 weeks per semester 39.67 total hours of lab activity per semester ~ 1.59 ECTS Total of lecture and lab activity= 119 total hours per semester ~ 4.77 ECTS**

Figure 5.1 Transparency of workload for lecture and lab activity

UPM

Based on your conclusion about "an updated reference and practicum activity'" on Module Handbook, UPM already made some revisions. It can be viewed on this link https://s1-matematika.fmipa.unesa.ac.id/page/module-handbook.

UPP

We are grateful for peer recommendation. We have made improvements to the module handbook according to peer input regarding the calculation of workloads (ects). These changes can be seen at the following link https://s1-fisika.fmipa.unesa.ac.id/page/module-handbook .

UPC

The module handbook at UPC has been adjusted by updating the teaching format

in the module description. This update is also carried out to identify what course is a lecture and what course includes laboratory work. These changes can be seen at: https://s1-kimia.fmipa.unesa.ac.id/page/module-handbook

UPB

Module handbook has been revised per recommendation to further detailed courses with laboratory work, in this https://s1-biologi.fmipa.unesa.ac.id/page/module-handbook.

FEEDBACK 2:

The peers discuss with UNESA about the admission of students with disabilities, particularly colour-blindness, as this is a known issue in Indonesia. The university stresses that it follows a general non-discrimination policy and that students with disabilities are eligible for admission into the programmes. The peers understand that applicants with colour-blindness are not admitted to UPB, UPC, and UPP. They are aware that this is common practice at Indonesian universities, but are convinced that it is unnecessary. The peers emphasise that with modern tools and technology, colour-vision is no longer an important ability even in laboratories. Regarding the study programmes at hand, it is even less of an issue as the experiments are conducted in groups and the colour-blindness of one student can be easily compensated by the other group members. Hence, they consider such an admission criterion too restrictive and expect UNESA to change it.

RESPONSE 2:

In 2022, new student admissions no longer require colour blindness, all students can choose all study programs at FMIPA. This can be seen on the link https://admisi.unesa.ac.id/

CRITERION 6 QUALITY MANAGEMENT: QUALITY ASSESSMENT AND DEVELOPMENT

FEEDBACK 1:

However, the peers notice that the students are not members of the boards at UNESA. The peers are convinced that it would be very useful to have student members in the different boards. For this reason, they recommend that student representatives should be official members of boards at UNESA (at least on programme and faculty level) and be actively involved in the decision-making processes for further developing the degree programmes.

RESPONSE 1:

UPM

UPM will add the students representative (two students) as members of the board officially. https://s1-matematika.fmipa.unesa.ac.id/page/curriculum-board

UPP

To better represent the role of students in making decisions at UPP, we will involve students in the curriculum board for further developing the degree programs. The name of a student who is included in the curriculum team at UPP is Fariz Irkham Muadhif. These changes can be seen at the link : https://s1-fisika.fmipa.unesa.ac.id/page/kurikulum

UPC

To better represent the role of students in the study program curriculum, UPC involves students in the curriculum board for further developing the degree programs. These changes can be seen at the link: https://s1-kimia.fmipa.unesa.ac.id/page/upc-curriculum-board

UPB

UPB involves students' representatif in the curriculum board for further developing the degree programs (https://s1-biologi.fmipa.unesa.ac.id/page/tim-kurikulum)

F Summary: Peer recommendations (27.05.2022)

Taking into account the additional information and the comments given by UNESA, the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly.

For the Biology, Chemistry, and Physics programmes

A 2. (ASIIN 4.3) Update and increase the instruments and the technical equipment in the teaching laboratories so that experiments can be done by groups of not more than two to three students.

Recommendations

For all degree programmes

E 1. (ASIIN 2.1) It is recommended to revise the curricular structure by combing small related courses to larger modules.

E 2. (ASIIN 2.1) It is recommended to better incorporate new developments in the different scientific areas (e.g. bioinformatics, genomics, data science, and computational chemistry) in the curricula.

E 3. (ASIIN 2.1) It is recommended to reduce the number of non-subject–specific courses and their grades should not be counted for the final grade.

E 4. (ASIIN 2.1) It is recommended to further promote the academic mobility of the students and to cooperate with more renowned international universities.

E 5. (ASIIN 3) It is recommended to improve the scientific quality of the Bachelor's theses by better preparing students for writing scientific papers.

E 6. (ASIIN 4.1) It is recommended to increase the research output and to make the research activities more visible.

E 7. (ASIIN 4.1) It is recommended to increase the number of teachers with a PhD degree.

E 8. (ASIIN 4.3) It is strongly recommended to significantly increase the funding for research and teaching.

G Comment of the Technical Committees (13.06.2022)

Technical Committee 09 – Chemistry, Pharmacy (08.06.2022)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure and agrees with the proposed requirements and recommendations.

The Technical Committee 09 – Chemistry, Pharmacy recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

Technical Committee 10 – Life Sciences (13.06.2022)

Assessment and analysis for the award of the ASIIN seal:

The proposed two requirements relate to the technical equipment and the students' workload. In addition, eight recommendations are proposed. The TC discusses the procedure and agrees with the proposed requirements and recommendations.

The Technical Committee 10 – Life Sciences recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

Technical Committee 12 – Mathematics (10.06.2022)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the accrediting procedure in detail, especially about the recommendations with respect to the academic qualification of the teachers (percentage of PhD holders) and the quality of the Bachelor's theses. At the end, the TC follows the assessment of the peers without any changes.

The Technical Committee 12 – Mathematics recommends the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

Technical Committee 13 – Physics (13.06.2022)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and proposes to rewrite E6 in a way that focuses on enabling lecturers to conduct research and to publish their results, rather than recommending highlighting the quantity of publications.

The Technical Committee 13 – Physics recommends the award of the seals as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

E 6. (ASIIN 4.1) It is recommended to create a framework that allows lecturers to conduct research and produce visible results.

H Decision of the Accreditation Commission (24.06.2022)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discusses the procedure and agrees with the assessment of the peer group. The AC does not follow the suggestion of TC 13 – Physics, but adds to recommendation E5 in order to make clear that the goal should be to increase the quality and not only the quantity of the research output.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Biology	With requirements for one year	-	30.09.2027
Ba Chemistry	With requirements for one year	-	30.09.2027
Ba Mathematics	With requirements for one year	-	30.09.2027
Ba Physics	With requirements for one year	-	30.09.2027

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly.

For the Biology, Chemistry, and Physics programmes

A 2. (ASIIN 4.3) Update and increase the instruments and the technical equipment in the teaching laboratories so that experiments can be done by groups of not more than two to three students.

Recommendations

For all degree programmes

E 1. (ASIIN 2.1) It is recommended to revise the curricular structure by combing small related courses to larger modules.

E 2. (ASIIN 2.1) It is recommended to better incorporate new developments in the different scientific areas (e.g. bioinformatics, genomics, data science, and computational chemistry) in the curricula.

E 3. (ASIIN 2.1) It is recommended to reduce the number of non-subject–specific courses and their grades should not be counted for the final grade.

E 4. (ASIIN 2.1) It is recommended to further promote the academic mobility of the students and to cooperate with more renowned international universities.

E 5. (ASIIN 3) It is recommended to improve the scientific quality of the Bachelor's theses by better preparing students for writing scientific papers.

E 6. (ASIIN 4.1) It is recommended to increase the quality of the research output and to make the research activities more visible.

E 7. (ASIIN 4.1) It is recommended to increase the number of teachers with a PhD degree.

E 8. (ASIIN 4.3) It is strongly recommended to significantly increase the funding for research and teaching.

I Fulfilment of Requirements (23.06.2023)

Analysis of the peers and the Technical Committees (12.06.2023)

Requirements

For all programmes

A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly.

Initial Treatment	
Peers	Fulfilled Vote: per majority Justification: UNESA has verified the students' total workload and adjusted the ECTS points. One expert thinks that the students' total workload needs to be verified in more detail.
TC 09	Fulfilled Vote: unanimous Justification: The Technical Committee agrees with the majority of the peers.
TC 10	Fulfilled Vote: unanimous Justification: The Technical Committee agrees with the majority of the peers.
TC 12	Fulfilled Vote: unanimous Justification: The Technical Committee follows the assessment of the peers.
TC 13	Fulfilled Vote: unanimous Justification: The Technical Committee follows the assessment of the peers without any changes.

For the Biology, Chemistry, and Physics programmes

A 2. (ASIIN 4.3) Update and increase the instruments and the technical equipment in the teaching laboratories so that experiments can be done by groups of not more than two to three students.

Initial Treatment	
Peers	Fulfilled Vote: unanimous Justification: UNESA has already increased the lab equipment and will continue to do so. It is a significant improvement for the students. Additionally, the organisation of the practical courses with a lower number of students per group is done.
TC 09	Fulfilled Vote: unanimous Justification: The Technical Committee agrees with the peers.
TC 10	Fulfilled Vote: unanimous Justification: The Technical Committee agrees with the peers.
TC 12	Fulfilled Vote: unanimous Justification: The Technical Committee follows the assessment of the peers.
TC 13	Fulfilled Vote: unanimous Justification: The Technical Committee follows the assessment of the peers without any changes.

Decision of the Accreditation Commission (23.06.2023)

The AC decides that all requirements are fulfilled.

The Accreditation Commission decides to award the following seals:

Degree Programme	**ASIIN seal**	**Subject-specific labels**	**Maximum duration of accreditation**
Ba Biology	All requirements fulfilled	-	30.09.2027
Ba Chemistry	All requirements fulfilled	-	30.09.2027

Degree Programme	ASIIN seal	Subject-specific labels	Maximum duration of accreditation
Ba Mathematics	All requirements fulfilled	-	30.09.2027
Ba Physics	All requirements fulfilled	-	30.09.2027

Appendix: Programme Learning Outcomes and Curricula

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Biology:

Aspect	PLO	Code
Knowledge	Demonstrate basic knowledge of biology relevant to science and mathematics to understand current scientific phenomena and issues and apply them in problem solving.	KNO-1 (PLO 1)
	Demonstrate basic knowledge of cell and molecular biology, organismal biology, ecology and evolution to analyze current biological issues.	KNO-2 (PLO 2)
	Apply biological knowledge and technology for solving	KNO-3
	natural resource and environmental problems both in the laboratory and in real practice that supports the profession and or entrepreneurship.	(PLO 3)
	Demonstrate the basic principles of software applications and instruments, standard analytical methods, and synthesis in biology	KNO-4 (PLO 4)
Specific Competence	Work independently in laboratory to develop relevant skills by applying bioethics and occupational safety	SC-1 (PLO 5)
	Design and conduct experiments in the field of biology, manage, analyze, interpret, document and store data research, to manage living natural resources	SC-2 (PLO 6)
	Apply transferable skills in biology to develop ecopreneurship (eco-innovation, eco-opportunity, eco-commitment).	SC-3 (PLO 7)
General Competence	Communicate scientific ideas, both orally and in writing using appropriate communication media as targeted, as a provision for lifelong learning for academic self-development.	GC-1 (PLO 8)
	Apply logical, critical, systematic, and innovative thinking in the context of developing or implementing science and / or technology in accordance with their field of expertise	GC-2 (PLO 9)
Attitude	Work independently both as individuals and in groups, and responsibly in completing tasks in classes, laboratories, and in the field.	AT-1 (PLO 10)
	Able to demonstrate the religious and cultural values of the nation, as well as academic ethics in carrying out their professional duties	AT-2 (PLO 11)

The following **curriculum** is presented:

Courses in 1st Year

1ST Semester					2nd Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	1000002033	Pancasila	2	3.18	1	1000002026	Religion Education	2	3.18
2	4620103033	General Biology*	3	4.77	2	1000002033	Citizenship Education	2	3.18
3	4620103103	General Chemistry*	3	4.77	3	4620102021	English For Biology	2	3.18
4	4620103073	General Physics*	3	4.77	4	4620104173	Plant Structure and Development*	4	6.36
5	4620103119	Mathematic	3	4.77	5	4620102187	Laboratory Technique*	2	3.18
6	1000002003	Indonesian	2	3.18	6	4620103026	Biochemistry*	3	4.77
7	4620103018	English	3	4.77	7	4620104010	Animal Anatomy*	4	6.36
8	4620103119	Physical Education	2	3.18	8	4620102106	Conservation of Natural Resources and Environment	2	3.18
Total credit			**21**	**33.39**	**Total credit**			**21**	**33.39**

*) integrated with practicum

Courses in 2nd Year

3rd Semester					4th Semester				
No	Course code	Course name	CU	ECTS	No	Course code	Course name	CU	ECTS
1	4620104076	Plant Physiology*	4	6.36	1	4620102030	Cell Biology	2	3.18
2	4620103127	Microbiology*	3	4.77	2	4620104044	Ecology*	4	6.36
3	4620104161	Animal Systematics*	4	6.36	3	4620104074	Animal Physiology*	4	6.36
4	4620104163	Plant Systematics*	4	6.36	4	4620104081	Genetics*	4	6.36
5	1000002011	Basic Social and Cultural Sciences	2	3.18	5	4620103036	Biostatistics and Biocomputer	3	4.77
6	4620102192	Entrepreneurship	2	3.18	6	4620102068	Science Philosophy	2	3.18
Total credit			**19**	**30.21**	**Total credit**			**19**	**30.21**

Courses in 3rd Year

5th Semester					6th Semester				
No	**Course code**	**Course name**	**CU**	**ECTS**	**No**	**Course code**	**Course name**	**CU**	**ECTS**
1	4620102028	Molecular Biology	2	3.18	1	4620102023	Bio exploration	2	3.18
2	4620103041	Ecophysiology	3	4.77	2	4620102032	Applied biology	2	3.18
3	4620102064	Evolution	2	3.18	3	4620102186	Analysis technique of molecular biology	2	3.18
4	4620103124	Research Methodology	3	4.77	4	4620103154	Internship	3	4.77
5	4620102134	Microtechnique	2	3.18	5	4620103108	Tissue culture*	3	4.77
6	4620102099	Advanced entrepreneurship	2	3.18	6		Electives Course 1	2	3.18
7	4620103117	Management of Quality Control	3	4.77	7		Electives Course 2	2	3.18
8	4620102037	Biotechnology	2	3.18	8		Electives Course 3	2	3.18
					9		Electives Course 4	2	3.18
Total credit			**19**	**30.21**	**Total credit**			**20**	**31.8**

*) integrated with practicum

Courses in 4th Year

7th Semester					8th Semester				
No	**Course code**	**Course name**	**CU**	**ECTS**	**No**	**Course code**	**Course name**	**CU**	**ECTS**
1	4620102159	Seminar	2	3.18	1	4620106164	Thesis	6	9.54
2	4620103194	Community service	3	4.77	2		Electives Course 10	2	3.18
3		Electives Course 5	2	3.18	3		Electives Course 11	2	3.18
4		Electives Course 6	2	3.18					
5		Electives Course 7	2	3.18					
6		Electives Course 8	2	3.18					
7		Electives Course 9	2	3.18					
Total credit			**11**	**17.49**	**Total credit**			**10**	**15.9**

Electives:

Odd Semester					Even Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4620102003	Algology *)	2	3.18	26	4620102083	Population Genetics *)	2	3.18
2	4620102022	Bacteriology *)	2	3.18	27	4620102090	Horticulture	2	3.18
3	4620102038	Cultivation of water biota *)	2	3.18	28	4620102092	Nutrient science *)	2	3.18
4	4620103049	Ocean Ecology *)	2	3.18	29	4620102094	Immunology *)	2	3.18
5	4620102054	Ecotoxicology *)	2	3.18	30	4620102112	Limnology *)	2	3.18
6	4620102059	Plant Embryology *)	2	3.18	31	4620102116	Management of Water Ecosystems *)	2	3.18
7	4620102060	Endocrinology*)	2	3.18	32	4620102125	Mycology *)	2	3.18
8	4620102061	Entomology *)	2	3.18	33	4620102130	Industrial Microbiology *)	2	3.18
9	4620102062	Ethnobotany *)	2	3.18	34	4620102136	Plant morphogenesis *)	2	3.18
10	4620102066	Pharmacognosy **)	2	3.18	35	4620102140	Parasitology *)	2	3.18
11	4620102077	Phytogeography *)	2	3.18	36	4620102144	Waste management *)	2	3.18
12	4620102078	Phytohormone *)	2	3.18	37	4620102153	Planktonology *)	2	3.18
13	4620102156	Protozoology *)	2	3.18	38	4620102162	Microbial Systematics*)	2	3.18
14	4620102158	Animal reproduction*)	2	3.18	39	4620102191	Zoogeography*)	2	3.18
15	4620102007	Analysis of environmental impact*)	2	3.18	40	4620102051	Soil Ecology *)	2	3.18
16	4620102009	Human anatomy and physiology*)	2	3.18	41	4620102063	Ethology*)	2	3.18
17	4620102029	Food biology *)	2	3.18	42	4620102075	Comparative Physiology*)	2	3.18
18	4620102050	Social ecology *)	2	3.18	44	4620102084	Applied Genetics*)	2	3.18

Odd Semester					Even Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
19	4620102085	Plant Pests and Diseases * *)	2	3.18	45	4620102131	Health Microbiology **)	2	3.18
20	4620102088	Histology* *)	2	3.18	46	4620102132	Environmental Microbiology * *)	2	3.18
21	4620102114	Malacology* *)	2	3.18	47	4620102138	Oncology**)	2	3.18
22	4620102115	Mammalogy* *)	2	3.18	48	4620102139	Ornithology* *)	2	3.18
23	4620102146	Management of Natural resources * *)	2	3.18	49	4620102148	Environmental Science * *)	2	3.18
24	4620102179	Numerical taxonomy* *)	2	3.18	50	4620102190	Virology**)	2	3.18
Total credit of electives available					**96 (152.64 ECTS)**				

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Chemistry:

ASPECT	PLO	CODE
KNOWLEDGE	1. Able to master the concepts of structure, dynamics and energy, as well as the basic principles of separation, analysis, synthesis, and characterization of micromolecular compounds and their applications	**KNO-1** (PLO 1)
	2. Able to master the basic principles and knowledge of how to operationalize instruments for the analysis and characterization of compounds, as well as utilizing ICT for modeling more specific molecules	**KNO-2** (PLO 2)
SKILL	3. Able to master the principles of Occupational Health and Safety, manage laboratories and use their equipment, and operate instrumental of chemistry	**SKI-1** (PLO 3)
	4. Able to design an activity to solve problems by implementing capabilities in the field of chemistry that refers to ecopreunership	**SKI-2** (PLO 4)
COMPETENCIES	5. Able to apply logical, critical, systematic and innovative thinking in the context of the development or implementation of science and technology by observe and applying the value of humanities in accordance with the field of chemistry in solving problems	**COM-1** (PLO 5)
	6. Able to master the basics of the scientific method, designing and conducting research, compiling scientific reports and communicating them both verbally and in writing by utilizing information and communication technology	**COM-2** (PLO 6)
ATTITUDE AND SOCIAL	7. Able to build teamwork and have entrepreneurial skills that are environmental perspective, and make the right, honest and responsible decisions in solving problems of chemistry and have social sensitivity as a obligation of citizens and religious communities	**SOC-1** (PLO 7)
	8. Able to adapt to various developments in chemistry, continue to develop and learn throughout long-life education, both formal and non-formal	**SOC-2** (PLO 8)

The following **curriculum** is presented:

Courses in 1st Year

1st Semester					2nd Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4720102178	Digital Literacy	2	3.18	1	3074212017	English for Chemistry	2	3.18
2	0001212009	Indonesian	2	3.18	2	3074212018	Qualitative Chemical Analysis	2	3.18
3	0002213005	English	3	4.77	3	3074213019	Basic Chemistry 2	3	4.77
4	3074213012	General Biology	3	4.77	4	3074213020	Quantum Chemistry	3	4.77
5	3074213013	General Physics	3	4.77	5	3074212021	Conservation of Natural Resources and Environment	2	3.18
6	3074213014	Basic Chemistry 1	3	4.77	6	3074213022	Mathematics for Chemistry	3	4.77
7	3074213015	Basic Mathematics	3	4.77	7	0001212007	Citizenship Education	2	3.18
8	0001212008	Pancasila	2	3.18	8	0001212001	Religion Education	2	3.18
Total			21	33.39	Total			19	30.21

Courses in 2nd Year

3rd Semester					4th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	3074213023	Laboratory Organization	3	4.77	1	3074212033	Basics of Chemical Separations	2	3.18
2	3074212025	Philosophy of Science	2	3.18	2	3074212034	Coordination Chemistry	2	3.18
3	0002212006	Basic Social and Cultural Sciences	2	3.18	3	3074213035	Chemical Kinetics	3	4.77
4	3074213028	Quantitative Chemical Analysis	3	4.77	5	3074213037	Polyfunction Organic Compound	2	3.18
5	3074213029	Basic Theory of Inorganic	3	4.77	6	3074212038	Practicum of Organic Chemistry	2	3.18
6	3074213030	Thermodynamics of Chemistry	3	4.77	7	3074213039	Basic Statistics	2	3.18
7	3074213031	Monofunction Organic Compounds	3	4.77	9	Elective Courses		6	9.54
8	0002212008	Entrepreneurship	2	3.18	Total			19	30.21
Total			21	33.39					

Courses in 3rd Year

5th Semester					6th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	3074212040	Structure and Function of Biomolecule	3	4.77	1	3074211048	Practicum of Inorganic Chemistry	2	3.18
2	3074212041	Spectroscopy and Chromatographic Methods	2	3.18	2	3074213049	Metabolism and Pathways of Genetics Information	3	4.77
3	3074212042	Main Elements of Chemistry	2	3.18	3	3074211051	Practicum of Analytical Instrument	2	3.18
4	3074212045	Mechanism of Organic Reaction	2	3.18	4	3074213052	Transition Elements of Chemistry	2	3.18
5	3074213046	Surface Chemistry	3	4.77	5	3074213055	Organic Synthetic	2	3.18
6	3074213047	Research Methodology	3	4.77	6	3074213058	Molecular Structure Elucidation	3	4.77
7	3074212050	Electrochemistry Analysis	2	3.18	7	Elective Course		4	6.36
8	3074211053	Practicum of Biochemistry	2	3.18	Total			18	28.62
9	Elective Course		2	3.18					
Total			21	33.39					

Courses in 4th Year

7th Semester					8th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	3074213044	Environmental Chemistry	3	4.77	1	3074216060	Thesis	6	9.54
2	0002213009	Community Service	3	4.77	2	Elective Course		2	3.18
3	0002213010	Internship	3	4.77	Total			8	12.72
4	3074212054	Seminar	2	3.18					
5	Elective Courses		6	9.54					
Total			17	27.03					

Electives:

Odd Semester					Even Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	3074112061	Computational Chemistry	2	3.18	1	3074112062	Stereochemistry	2	3.18
2	3074112063	Pharmaceutical Chemistry	2	3.18	2	3074112074	Electrochemistry	2	3.18
3	3074112069	Natural Product Chemistry	2	3.18	3	3074212036	Nuclear Chemistry and Radiochemistry	2	3.18
4	3074112070	Cosmetics	2	3.18	4	3074212032	Literature of Chemistry	2	3.18
5	3074112064	Organometallic Compound	2	3.18	5	3074112065	Career Development	2	3.18
6	3074112066	Food Analysis	2	3.18	6	3074112071	Material Chemistry	2	3.18
7	3074112067	Evaluation of Nutritional Value of Food	2	3.18	7	3074112072	Microbiology	2	3.18
8	3074112068	Capita Selecta	2	3.18	8	3074112073	Solid State Chemistry	2	3.18
9	3074112076	Research Technique of Biochemistry	2	3.18	9	3074113075	Food Chemistry	2	3.18
10	3074112077	Toxicology	2	3.18	10	3074212043	Industrial Chemistry	2	3.18
11	3074112080	Bio-inorganic	2	3.18	11	3074112078	Biotechnology	2	3.18
12	3074212056	Mechanism of Inorganic Reaction	2	3.18	12	3074112079	Organic Polymer Chemistry	2	3.18

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Mathematics:

ASPECTS	PLO	CODE
KNOWLEDGE	1. Demonstrating mathematical knowledge and mathematical insight.	KNO-1 (PLO 1)
	2. Identifying and explaining the characteristics of mathematical problems.	KNO-2 (PLO 2)
SKILL	1. Formulating and solving fundamental mathematical problems.	SKI-1 (PLO 3)
	2. Applying the basic principles of mathematics to solve simple* mathematical problems.	SKI-2 (PLO 4)
	3. Analyzing the formal structure of mathematical problems and relevant fields.	SKI-3 (PLO 5)
	4. Implementing simple mathematical procedures in computer programs.	SKI-4 (PLO 6)
COMPETENCES	1. Proving mathematical statements by various methods.	COM-1 (PLO 7)
	2. Generating ideas used for completing mathematical tasks and to communicate them either in writing or orally, in accordance with scientific principles.	COM-2 (PLO 8)
	3. Solving mathematical problems using technology	COM-3 (PLO 9)
ATTITUDE AND	1. Working collaboratively and having social sensitivity	SOC-1
SOCIAL	(obligations as citizens and towards religion) and being able to bring change to a techno-ecopreneurship community.	(PLO 10)
	2. Showing responsibility for work in the field of expertise independently, having a lifelong willingness to learn, and having the courage to make decisions.	SOC-2 (PLO 11)

The following **curriculum** is presented:

Courses in 1st Year

1st Semester					2nd Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	1000002003	Indonesian	2	3.18	1	100000202X	Religion Education	2	3.18
2	1000002020	Pancasila	2	3.18	2	4420103024	English	3	4.77
3	4420103031	General Biology	3	4.77	3	1000002033	Citizenship Education	2	3.18
4	4420103032	Foundation of Mathematics	3	4.77	4	4420102159	Digital Literacy	2	3.18
5	4420103038	General Physics	3	4.77	5	4420104055	Integral Calculus	4	6.36
6	4420104051	Differential Calculus	4	6.36	6	4420103082	Statistics Method	3	4.77
7	4420103062	General Chemistry	3	4.77	7	4420103010	Elementary Linear Algebra	3	4.77
					8	4420102068	Conservation of Natural Resources and Environment	2	3.18
		Total	20	31.80			**Total**	21	33.39

Courses in 2nd Year

3th Semester					4th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	1000002011	Basic Social and Cultural Sciences	2	3.18	1	4420103018	Real Analysis I	3	4.77
2	4420102158	Physical Education	2	3.18	2	4420103042	Analytical Geometry	3	4.77
3	4420103029	Programming language	3	4.77	3	4420104057	Multivariable Calculus	4	6.36
4	4420103041	Geometry	3	4.77	4	4420103132	Data Structures and Algorithm Analysis	3	4.77
5	4420103074	Discrete Mathematics	3	4.77	5	4420103138	Graph Theory	3	4.77
6	4420103109	Ordinary Differential Equation	3	4.77	6	4420103078	Numerical Method	3	4.77
7	4420103115	Operations Research	3	4.77					
8	4420102136	Elementary Number Theory	2	3.18					
		Total	21	33.39			**Total**	19	30.21

Courses in 3rd Year

5th Semester					6th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4420102151	Entrepreneurship	2	3.18	1	4420103004	Abstract Algebra II	3	4.77
2	4420103002	Abstract Algebra I	3	4.77	2	4420103137	Fuzzy Theory	3	4.77
3	4420103019	Real Analysis II	3	4.77	3	4420103147	Topology	3	4.77
4	4420103087	Probability and Statistics	3	4.77			Elective courses	13	20.67
5	4420103110	Partial Differential Equation	3	4.77					
6	4420103006	Linear Algebra	3	4.77					
		Elective courses	5	7.95					
		Total	22	34.98			**Total**	22	34.98

Courses in 4th Year

7th Semester					8th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4420103088	Mathematical Modelling	3	4.77	1	4420106121	Thesis	6	9.54
2	4420102116	Seminar on Mathematics	2	3.18			Elective courses	14	22.26
3	4420103153	Community Service	3	4.77					
4	4420102111	Internship	2	3.18					
		Elective courses	12	19.08					
		Total	22	34.98			**Total**	20	31.80

Electives:

Odd Semester					Even Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4420102156	Public Communication *)	2	3.18	1	4420102071	Management and Leadership*)	2	3.18
2	4420103013	Functional Analysis *)	3	4.77	2	4420103001	Actuarial *)	3	4.77
3	4420103157	Special Functions *)	3	4.77	3	4420103008	Advanced Linear Algebra*)	3	4.77
4	4420103044	Fractal Geometry*)	3	4.77	4	4420103015	Complex Analysis *)	3	4.77
5	4420103045	Transformational Geometry *)	3	4.77	5	4420103016	Numerical Analysis *)	3	4.77
6	4420103047	Graf of Topology*)	3	4.77	6	4420103023	Nonlinear Control Application *)	3	4.77
7	4420103063	Mathematical Computation*)	3	4.77	7	4420102033	Philosophy of Mathematics *)	2	3.18
8	4420102093	Introduction of Automata Theory*)	2	3.18	8	4420103046	Random Graf*)	3	4.77
9	4420103096	Introduction of Artificial Intelligence*)	3	4.77	9	4420102101	Academic Writing*)	2	3.18
10	4420102097	Introduction of Cryptography*)	2	3.18	10	4420103114	Design of Experiment*)	3	4.77
11	4420103118	Dynamical System*)	3	4.77	11	4420103117	Data Base System*)	3	4.77
12	4420103155	Multivariate statistics *)	3	4.77	12	4420103120	System of Geometry *)	3	4.77
13	4420102134	Number Theory*)	2	3.18	13	4420103122	Mathematical Statistics*)	3	4.77
14	4420103139	Algebraic Graph Theory*)	3	4.77	14	4420103141	Coding Theory*)	3	4.77
15	4420103142	System and Control Theory*)	3	4.77	15	4420103148	Differential Topology*)	3	4.77
16	4420103145	Measure Theory*)	3	4.77					

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree Physics:

Aspect	Program Learning Outcomes	Code
Knowledge	Able to **demonstrate** knowledge of Classical Physics and Modern Physics	KNO-1 (PLO 1)
	Able to **formulate** a physical systems as physical model by using mathematics	KNO-2 (PLO 2)
	Able to **solve problems** in physical systems comprehensively by using mathematics and computational tools.	KNO- 3 (PLO 3)
Skill	Able to **analyze** a physical system by applying mathematics and computational tools/ICT.	SKI-1 (PLO 4)
	Able to **design and conduct** experiments in learning physics by applying the scientific methods.	SKI-2 (PLO 5)
	Able to **improve their knowledge** and be able to continue their study in a higher education.	SKI-3 (PLO 6)
	Able to **communicate** their ideas and/or research results in academic writing and speaking effectively.	SKI-4 (PLO 7)
Social	Able to **make a decision** based on the data and information in order to fulfil and evaluate their task responsibility.	SOC-1 (PLO 8)
	Able to **work as an individual as well as a team** effectively, **have entrepreneurship skill** and awareness of environmental issues.	SOC-2 (PLO 9)
Attitude	Able to **demonstrate good scientist's manners**, critical thinking and innovation skills in research and professional fields; and willing to do lifelong learning.	ATT-1 (PLO 10)
	Able to **demonstrate the appreciation** of **religious values, and nationalism as citizens** as well as conducting their tasks professionally.	ATT-2 (PLO 11)

The following **curriculum** is presented:

Courses in 1st Year

1st Semester					2nd Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	1000002003	Indonesian	2	3.18	1	1000002026	Religion Education	2	3.18
2	4520103026	General Biology*	3	4.77	2	4520103021	English for Physics	3	4.77
3	4520104055	Basic Physics I*	4	6.36	3	4520104057	Basic Physics II*	4	6.36
4	4520103104	General Chemistry*	3	4.77	4	4520104070	Mathematical Physics I	4	6.36
5	4520103118	Basic Mathematics	3	4.77	5	4520102227	Digital Literacy	2	3.18
6	1000002018	Pancasila	2	3.18	6	4520102107	Conservation of Natural Resources and Environment	2	3.18
7	4520102196	Physics Measurement System	2	3.18	7	1000002033	Citizenship Education	2	3.18
8	4520102219	Physical Education	2	3.18	8	4520103061	Computational Physics	3	3.18
TOTAL			**21**	**33.39**	**TOTAL**			**22**	**34.98**

Courses in 2nd Year

3rd Semester					4th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4520103053	Earth Physics	3	4.77	1	4520103042	Basic Electronics II*	3	4.77
2	4520103041	Basic Electronics I*	3	4.77	2	4520103233	Mathematical Physics 3	3	4.77
3	4520104127	Mechanics*	4	6.36	3	4520103074	Modern Physics*	3	4.77
4	4520104071	Mathematical Physics 2	4	6.36	4	4520102203	Statistics	2	3.18
5	4520103209	Thermodynamics*	3	4.77	5	4520103114	Electromagnetics*	3	4.77
6	4520104086	Material Science	3	4.77	6	4520103084	Waves*	3	4.77
7	4520102216	Entrepreneurships	2	3.18	7	4520102143	Research Methodology	3	4.77
TOTAL			**22**	**34.98**	**TOTAL**			**20**	**31.80**

Courses in 3rd Year

5th Semester					6th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4520104065	Quantum Physics	4	6.36	1	4520103082	Solid-state Physics	4	6.36
2	4520102149	Optics	3	4.77	2	4520102105	Colloquium	2	3.18
3	4520103043	Electronics (Advanced)	2	3.18	3	4520102116	Industrial Management	2	3.18
4	4520103079	Statistical Physics	3	4.77	4	452010ES-1	Elective course (Even Semester-1)	2	3.18
5	452010OS1	Elective course (Odd Semester-1)	2	3.18	5	452010ES-2	Elective course (Even Semester-2)	2	3.18
6	452010OS2	Elective course (Odd Semester-2)	2	3.18	6	452010ES-3	Elective course (Even Semester-3)	2	3.18
7	452010OS3	Elective course (Odd Semester-3)	2	3.18	7	452010ES-4	Elective course (Even Semester-4)	2	3.18
8	452010OS4	Elective course (Odd Semester-4)	2	3.18	8	452010ES-5	Elective course (Even Semester-5)	2	3.18
					9	452010ES-6	Elective course (Even Semester-6)	2	3.18
TOTAL			**20**	**31.80**	**TOTAL**			**20**	**31.80**

Courses in 4th Year

7th Semester					8th Semester				
No	Course Code	Course Name	CU	ECTS	No	Course Code	Course Name	CU	ECTS
1	4520103137	Nuclear Physics	3	4.77	1	4520106199	Thesis	6	9.54
2	4520102217	Internship	3	4.77					
3	4520102049	Community Service Program	3	4.77					
4	452010OS-5	Elective course (Odd Semester-5)	2	3.18					
5	452010OS-6	Elective course (Odd Semester-6)	2	3.18					
TOTAL			13	20.67	**TOTAL**			6	9.54

Electives:

Odd Semester						Even Semester					
No	Course Code		Course Name	CU	ECTS	No	Course Code		Course Name	CU	ECTS
1	452010207 5	452010 **OS-1**	Physical Oceanography -1	2	3.18	1	452010224 8	452010 **ES-1**	Physics of Atmosphre-1	2	3.18
2	452010223 7		Control System-1	2	3.18	2	45201 02076		Polymer Physics-1	2	3.18
3	452010301 8		Alloy Material-1	2	3.18	3	45201 02197		Microcontroller-1	2	3.18
4	45201 03111	452010 **OS-2**	Diffraction Data Analysis-2	2	3.18	4	45201 02150	452010 **ES-2**	Optoelectronics-2	2	3.18
5	452010200 7		Physical System Analysis-2	2	3.18	5	452010209 8		Ceramics-2	2	3.18
6	452010316 9		Digital Signal Processing-2	2	3.18	6	452010205 8		Physics of Volcanoes-2	2	3.18
7	452010207 7	452010 **OS-3**	Physics of Seismology-3	2	3.18	7	45201 02242	452010 **ES-3**	Robotics-3	2	3.18
8	452010321 0		Thermodynamics of Materials-3	2	3.18	8	45201 02246		Physics of Tsunami-3	2	3.18
9	452010225 0		Sensor-3	2	3.18	9	45201 03137		Material Characterization Method-3	2	3.18
10	452010206 7	452010 **OS-4**	Metal Physics-4	2	3.18	10	45201 03244	452010 **ES-4**	Energy Materials-4	2	3.18
11	452010225 2		Introduction to Geodynamics and Geothermal-4	2	3.18	11	45201 02247		Mitigation of Natural Disasters-4	2	3.18
12	452010310 9		Corrosion-4	2	3.18	12	45201 02195		Optical communication system-4	2	3.18
13	452010313 0	452010 **OS-5**	Material Fabrication Methods-5	2	3.18	13	452010209 6	452010 **ES-5**	Capita Selecta Material Physics-5	2	3.18
14	4520103037		Electroacoustic-5	2	3.18	14	45201 02045		Optical instrumentation-5	2	3.18
15	4520102142		Geophysical Measurement Method-5	2	3.18	15	45201 02156		Structured Programming-5	2	3.18

Odd Semester						Even Semester					
No	**Course Code**		**Course Name**	**CU**	**ECTS**	**No**	**Course Code**		**Course Name**	**CU**	**ECTS**
16	4520102254	452010 **OS-6**	Geophysical Fluids Dynamics-6	2	3.18	16	4520102245	452010 **ES-6**	Medical Materials-6	2	3.18
17	4520102251		Medical Physics-6	2	3.18	17	4520102259		Digital Image Processing-6	2	3.18
18	4520102009		Antenna and Propagation-6	2	3.18	18	4520102135		Physics Data Inversion Method-6	2	3.18
TOTAL				**36**	**57.24**	**TOTAL**				**36**	**57.24**