ASIIN Seal & Eurobachelor®/Euro-master®

Accreditation Report

Bachelor's Degree Programmes
Physics
Physics Education
Chemistry
Chemistry Education

Master's Degree Programme
Chemistry

Provided by
Universitas Pendidikan Indonesia, Bandung

Version: 28 March 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]
Sarjana Fisika	Bachelor of Physics	ASIIN	BAN-PT, 2019-2024	13
Sarjana Pendidikan Fisika	Bachelor of Physics Education	ASIIN	BAN-PT, 2019-2021	13
Sarjana Kimia	Bachelor of Chemistry	ASIIN, Eurobachelor® Label	BAN-PT, 2017-2022	09
Sarjana Pendidikan Kimia	Bachelor of Chemistry Education	ASIIN, Eurobachelor® Label	BAN-PT, 2016-2021	09
Master Kimia	Master of Chemistry	ASIIN, Euromaster® Label	BAN-PT, 2021	09
Date of the contract: 13.10.2020 **Submission of the final version of the self-assessment report:** 28.09.2021 **Date of the onsite visit:** 01.-03.12.2021 **Through videoconference**				
Peer panel: Prof. Dr. Hans-Joachim Galla, University of Muenster Prof. Dr. Gert-Ludwig Ingold, University of Augsburg Prof. Dr. Thomas Trefzger, University of Wuerzburg Dr. Nikolaus Nestle, BASF				

[1] ASIIN Seal for degree programmes; Eurobachelor®/Euromaster® Label: European Chemistry Label.
[2] TC: Technical Committee for the following subject areas: TC 09 - Chemistry; TC 13 - Physics.

Felix Cahyadi, Student at Institut Teknologi Bandung	
Representative of the ASIIN headquarter: Jan Philipp Engelmann	
Responsible decision-making committee: Accreditation Commission	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 09 – Chemistry, Pharmacy as of March 29, 2019 Subject-Specific Criteria of Technical Committee 13 – Physics as of March 20, 2020 Eurobachelor® and Euromaster® Guidelines as of January 2019	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	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
Bachelor of Physics	Sarjana Sains (S.Si.)/Bachelor of Science	/	6	Full time	/	8 semesters	145 SKS (around 234 ECTS)	Once per year (September) 1999
Bachelor of Physics Education	Sarjana Pendidikan (S.Pd.) /Bachelor of Education	/	6	Full time	/	8 semesters	146 SKS (around 236 ECTS)	Once per year (September) 1996
Bachelor of Chemistry	Sarjana Sains (S.Si.)/Bachelor of Science	/	6	Full time	/	8 semesters	147 SKS (around 238 ECTS)	Once per year (September) 1998
Bachelor of Chemistry Education	Sarjana Pendidikan (S.Pd.) /Bachelor of Education	/	6	Full time	/	8 semesters	150 SKS (around 243 ECTS)	Once per year (September) 1996
Master of Chemistry	Master Sains (S.Si.)/Master of Science	/	7	Full time	/	4 semesters	42 SKS (around 67 ECTS)	Twice per year (February and September) 2019

For the bachelor's degree programme Physics the institution has presented the following profile on the website:

"Vision

Pioneers and excels in the field of Physics

Pioneers and excellence are related to creativity and productivity that must be possessed by the academic community by relying on the pillars of expertise, professionalism, academic freedom, cooperation, and active participation. **Pioneering** has the meaning of initiative and creativity in innovating towards a superior Physics study program, and **excellence**

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

has the meaning of being national and global competitive, responsive, and always wanting to improve quality in a sustainable manner (*continuous quality improvement*).

Mission

- Carry out education to produce quality graduates in the field of Physics according to their interests, have entrepreneurial insight and master various soft skills.
- Carry out research and disseminate the results to develop the scientific field of Physics and or its application in the relevant technology field.
- Carry out community service based on study/research results in order to provide alternative solutions to various problems that occur in the community."

For the bachelor's degree programme Physics Education the institution has presented the following profile on the website:

"Vision

The pioneering and excellence lies in the creativity and productivity of the academic community by relying on the pillars of expertise, professionalism, academic freedom, cooperation, and active participation of the academic community. **Pioneering** has the meaning of initiative and creativity in innovating towards a superior Physics Education study program, and **excellence** has the meaning of being national and global competitive, responsive, and always wanting to improve quality in a sustainable manner (*continuous quality improvement*).

Mission

In order to realize the vision above, the mission is set as follows:

1. Organizing education to prepare professional physics educators to support Indonesia's national development.
2. Develop research in the field of physics education to become the foundation in the education process and community service.
3. Organizing community service based on the results of physics education research.
4. Establish cooperation in the field of education and research in physics education with domestic and foreign institutions."

For the bachelor's degree programme Chemistry the institution has presented the following profile on the website:

"**Vision**

In 2025 it will become a superior study program in the field of Chemistry and its application based on local potential in accordance with scientific developments

Mission

- Preparing chemistry graduates who are superior and globally competitive
- Develop a study of chemistry in accordance with the needs of the community and the development of science based on local potential advantages
- Organizing services to the community in the field of Chemistry
- Develop and strengthen national, regional and international partnership networks"

For the bachelor's degree programme Chemistry Education the institution has presented the following profile on the website:

"**Vision**

To become a pioneer and superior study program in the development of science and human resources in the field of chemistry education

Mission

- Organizing education to prepare excellent educators, trainers, researchers, and managers in the field of chemistry education and able to collaborate nationally and internationally
- Organizing research and development of innovative chemistry education rooted in local wisdom.
- Disseminate the results of research and development of chemistry education nationally and internationally."

For the master's degree programme Chemistry the institution has presented the following profile on the website:

"Vision

Excellent in the development of chemistry and its application in the field of biological chemistry and materials based on Indonesian natural resources

Mission

- Organizing education at the master's level in the field of chemistry;
- Develop chemical science and its application based on the diversity of Indonesia's natural resources;
- disseminate the results of scientific studies in chemistry for scientific progress and apply them to human welfare."

C Peer Report for the ASIIN Seal[4]

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
- Website of the department for chemistry education: http://kimia.upi.edu/
- Website of the department for physics education: http://fisika.upi.edu/
- Discussions during the audit

Preliminary assessment and analysis of the peers:
All programmes under review are offered by the Faculty of Mathematics and Science Education of Universitas Pendidikan Indonesia (UPI). Besides these programmes and outside of the scope of this accreditation procedure, the faculty also offers master's degree programmes in physics education and chemistry education. The peers learn that as part of the faculty's mid-term strategy, it plans to establish a master's programme in physics as well as doctoral programmes in the areas of physics and chemistry education.

The peers base their assessment of the learning outcomes as provided on the websites of the programmes and in the self-assessment report.

UPI has described and published objectives and programme learning outcomes (PLOs) for each of the five degree programmes. While the objectives are developed based on the vision and mission of the university as well as the respective faculty and department and are rather general and concise, the PLOs describe in greater detail the competences which the

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

students should acquire during their studies. The objectives and PLOs are contained in the faculty's academic handbook and published on the website of the degree programmes. They are thus well-anchored and accessible for students as well as for all other stakeholders.

The peers refer to the Subject-Specific Criteria (SSC) of the Technical Committee 13 – Physics as a basis for judging whether the intended learning outcomes of the bachelor's degree programmes Physics (BP) and Physics Education (BPE) as defined by UPI correspond with the competences as outlined by the SSC. Concerning the bachelor's degree programme Chemistry (BC) and Chemistry Education (BCE) as well as the master's degree programme Chemistry (MC), they take the SSC of the Technical Committee 09 – Chemistry as a basis for their assessment. They come to the following conclusions:

All programmes under review aim at imparting general and social competences such as critical and analytical thinking, effective communication and teamwork, and an awareness for professional and scientific standards and ethics. The peers appreciate this, although they detect a certain lack of coherence concerning these skills. For instance, the PLOs for BC include entrepreneurial skills that are omitted in MC where they would be very appropriate, MC does not mention teamwork at all, and interdisciplinary collaboration is named as a skill for all programmes but BCE. Given the similarities between the programmes, the peers would like UPI to better match the learning outcomes concerning the general and social competences.

Apart from these general skills, graduates of BP should have a fundamental understanding of the theoretical concepts and principles of classical and modern physics. They should be able to understand, formulate and solve basic problems in physics by applying the relevant mathematical, computational, and experimental methods. They should be capable of using these methods in interdisciplinary and practical contexts. Moreover, they should be familiar with scientific methods and be able to present problems and their solutions orally and in writing.

BPE aims at qualifying graduates to design, implement and assess physics learning processes, to develop adequate teaching and learning materials and to carry out research in this field. For this purpose, they need to have a basic understanding of physics as well as pedagogical principles and methods.

Graduates of BC should possess general knowledge of mathematics and science and specific knowledge of important concepts in the various areas of chemistry. They should be able to apply this knowledge to solve problems in chemistry in practical contexts and be aware of relevant health and safety rules and concepts. Furthermore, they should have entrepreneurial and business skills in chemistry-related areas.

BCE strives for similar objectives with graduates having skills in the different areas of chemistry as well as their practical application. Moreover, they should have a good understanding of pedagogical concepts and methods. Based on these, they should be able to plan, implement and assess learning processes in chemistry, using appropriate ICT tools.

MC builds upon the skills which students should have acquired during their bachelor's study and aims to impart deeper knowledge of chemistry. Graduates should be able to conduct chemical research including publications of scientific results and to apply their skills in industry.

The peers generally consider these subject-specific learning outcomes of the programmes reasonable. However, there is room for improvement regarding their exact formulation and the coherence between the different programmes, similarly to the general and social competences mentioned above, although to a smaller extent. For instance, BPE details many different aspects of teaching skills, whereas for BCE they are summarised into one short learning outcome. Consequently, they recommend that UPI better match the learning outcomes of the different programmes where there are similarities.

The peers learn that graduates of the bachelor programmes work as teachers (primarily those from the education programmes), laboratory staff, at various positions in industry, research institutions, government agencies, or in IT, which they consider in line with the learning outcomes laid out by UPI. The representatives of employers emphasises that they are very happy with the graduates' skills. This is confirmed by tracer studies among the graduates who consider the skills they learned in their programmes highly relevant for their occupation. As MC was only established in 2019, no information is yet available about the graduates' occupations. UPI informs the peers that they should mainly be qualified to work in research and development. Overall, the peers see that graduates of the programmes can take up occupations that correspond to their qualification.

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 SSC of the technical committees for chemistry and physics. The degree programmes are mostly designed in such a way that they meet the goals set for them. However, with regards to MC, there is some mismatch between the overall learning outcomes and the descriptions of learning outcomes and contents for the individual courses (see chapter 1.3). The objectives and intended learning outcomes of all degree programmes under review are reasonable and well founded.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-assessment report

Preliminary assessment and analysis of the peers:
The auditors confirm that the English translation and the original Indonesian names of all degree programmes under review correspond with the intended aims and learning outcomes as well as the main course language (Indonesian).

Criterion 1.3 Curriculum

Evidence:

- Self-assessment report
- Study plans of the degree programmes
- Module descriptions
- Website of the department for chemistry education: http://kimia.upi.edu/
- Website of the department for physics education: http://fisika.upi.edu/
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The curricula of the degree programmes are designed to implement the programme objectives and learning outcomes and they are subject to constant revision processes (see chapter 6). As such, the curricula are reviewed regularly and commented on by students and teachers as well as by external stakeholders such as alumni or partners from the private sector and other universities. Regular changes are made to ensure that the curricula are up to modern standards.

The bachelor programmes are designed for eight semesters or four years, in which the students have to achieve at least 145 (BP), 146 (BPE), 147 (BC) or 150 (BCE) credit points (SKS), which is equivalent to approximately 234-243 ECTS points (see chapter 2.2 for more details). The maximum period of study is 14 semesters. The master programme is designed for four semesters with 42 credit points (around 67 ECTS). Each semester is equivalent to 16 weeks of learning activities including one week for midterm exams and one week for final exams. The odd semester starts in September and ends in January of the following year, while the even semester lasts from February to June. In addition, there is an optional short summer semester in July and August, which is designed for students who need to make up missed or failed courses.

The curricula of the bachelor programmes consist of university and faculty requirements, compulsory courses in the respective programme, elective courses, mandatory educational courses (BCE, BPE), internships and final thesis. The university requirements for all bachelor's degree programmes at UPI are religious education, religious education seminar, civic education, Indonesian language, Pancasila, art or sports education, and community service (overall 14 credit points). These are mostly located in the first two semesters of study and are supposed to convey basic knowledge and skills to all undergraduate students. Basic skills in mathematics, science and engineering are covered by the faculty requirements that comprise two courses in semesters 1 and 2 (6 credit points).

In all bachelor programmes, the bulk of the courses are subject-specific compulsory courses, representing 80 to 99 credit points. For BC, these comprise fundamentals of chemistry, physical chemistry, analytical chemistry, inorganic chemistry, organic chemistry, biochemistry, and applied chemistry. BCE covers the same areas, albeit with fewer credit points to make room for compulsory courses in education, dealing with basic pedagogy as well as chemistry-specific learning strategies, media, and assessment. These compulsory elements are supplemented by elective courses (16/17 credit points), where students can choose specialised subjects from different areas of chemistry and, for BCE, also from such dealing with educational matters. BP and BPE contain compulsory courses in basic physics, modern physics, electromagnetism, thermodynamics, statistical physics, waves, and classical mechanics, while BPE has some additional pedagogical courses. Elective courses (16/17 credit points) can be chosen from a wide range of special topics.

In the final semester, students of all bachelor programmes undergo an internship (4 credit points) and work on their final thesis (6 credit points). In BPE and BCE, the internship is conducted at schools, in BC and BP, students can choose suitable companies or other organisations.

Overall, the peers are very satisfied with the curricula of the bachelor programmes. They see that the programmes are well structured and that the modules build on each other in a reasonable way, enabling the students to effectively reach the learning outcomes as laid down for the programmes as a whole. The peers particularly praise the high share of pedagogical and teaching courses in BPE and BCE. Although the teaching internship only takes place in the final semester, the peers learn that other courses include practical teaching exercises at campus as well as the observation of actual lessons at schools. As the students confirm, they feel well prepared for the challenges of the labour market, especially through the practical elements contained in all programmes.

The Master programme Chemistry is comprised of compulsory courses dealing with various areas of chemistry (i.e., physical chemistry, organic chemistry, inorganic chemistry, analytical chemistry, biochemistry, computational chemistry) and with research methods and

philosophy of science (22 credit points), elective courses that the students can choose from the fields of material chemistry or biological chemistry (12 credit points), and a thesis in the final semester (8 credit points).

From the self-assessment report and the explanations given during the audit, the peers understand that this programme is supposed to build upon competences at level 6 of the European Qualifications Framework, which the students have acquired during their previous studies. However, the topics and intended course outcomes of many modules do not adequately reflect this. Many of the modules have a large overlap with topics that are normally dealt with at an undergraduate level. For instance, this applies to the module "Selected Topics in Physical Chemistry" that contains, amongst other things, properties of gases and the laws of thermodynamics. Similarly, the "Selected topics in organic chemistry" module contains topics such as "nucleophilic attack" or "free radicals" which also are usually already taught at bachelor level and the contents of the "Selected topics in Analytical Module" strongly resemble the list of topics in a bachelor level course on "instrumental analytics". The module "Selected topics in biochemistry" seems to mainly repeat the contents of the bachelor course with respect to composition and structure of biomolecules. Furthermore, the taxonomy used for the course learning outcomes is often not adequate for a Master programme. The majority of learning outcomes have the students 'understand' a certain topic, while only few refer to higher levels of Bloom's taxonomy such as the competences to 'apply', to 'analyse' or to 'evaluate' ideas and concepts. Based on the module descriptions, the peers are not convinced that MC currently is consistently located at the level of a Master's degree programme (EQF level 7). This may be related to the programme having been established only recently and the module descriptions might not always accurately describe the contents and intended learning outcomes of the courses. During the discussions, UPI representatives emphasise that while there is some repetition in the first semester to build common ground for the students coming from different universities, there is also significantly more depth in various areas and parts of the teaching are based on current research papers. However, since the majority of compulsory courses is located in the first semesters, the peers stress that these already have to markedly go beyond a bachelor's level.

In any case, UPI has to ensure that the courses in MC consistently reach the level of a Master's degree programme and build upon competences achieved at the bachelor's level. This has to be reflected in the module descriptions.

The peers discuss with the university the ways in which the students can improve their English proficiency. They learn that the compulsory English course contained in every bachelor programme conveys important skills by focussing on the academic usage of English (such as technical terms, reading and writing scientific papers) and by incorporating active

communication and oral presentation. Moreover, English textbooks are utilised in many courses, there are international guest lecturers, the faculty offers international summer schools and there are extracurricular activities such as the English club. For MC, the participation in an international conference and the publication of the thesis results in an international journal is mandatory, further contributing to an active use of English. The peers appreciate these measures and consider them appropriate for the students to acquire sufficient English skills.

Criterion 1.4 Admission requirements

Evidence:

- Self-assessment report
- Admission websites
- Discussions during the audit

Preliminary assessment and analysis of the peers:
There are three different paths of admission into the bachelor's degree programmes:

1. National Selection of Higher Education or University (Seleksi Nasional Masuk Perguruan Tinggi Negeri, SNMPTN), a national admission system, which is based on the academic performance during high school.

2. Joint Selection of Higher Education or University (Seleksi Bersama Masuk Perguruan Tinggi Negeri, SBMPTN). This national selection is based on the results of a test (UTBK), which is held every year for university candidates. It is a nationwide written test (subjects: mathematics, Bahasa Indonesia, English, physics, chemistry, biology, economics, history, sociology, and geography).

3. Independent Selection (Seleksi Mandiri, SM): Students are selected based on criteria determined by UPI itself. It mainly follows the results of UTBK, but also considers other criteria such as achievements and motivation of the students.

For each academic year, the university determines the ratio of students admitted through these three ways.

For the master's degree programme, applicants need to have obtained a bachelor's degree in Chemistry or a similar subject with a minimum GPA of 2.75. The selection of students is based on a written entrance test and an interview.

For all bachelor programmes, the number of applicants by far exceeds the number of admitted students. From 2016 to 2020, the ratio averaged 1:17 (SNMPTN), 1:15 (SBMPTN),

and 1:7 (SM). The peers recognise that the high number of applications allows UPI to select students who are well qualified for the programmes. For MC, which started in 2019, there have been only few applicants by now, who were all admitted into the programme.

The peers acknowledge that the admission rules are generally binding and transparent. They are based on decrees by the ministry of education and UPI's written regulations. Moreover, the admission website informs potential students in great detail about the requirements and the necessary steps to apply for admission into the programmes.

However, they discuss with UPI 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, which the peers appreciate. Nonetheless, they consider the situation unclear with regards to colour-blindness. A call for the independent admission scheme in 2020 that is still available through UPI's website (http://dpkk.upi.edu/berita/berita_detail/35) states that applicants with partial or total colour-blindness are excluded from admission into BC and BCE, while more recent information is not available to the peers. Therefore, they ask UPI to clarify if applicants with colour-blindness are currently not eligible for admission into any of the programmes under review and if so, which of the programmes this rule concerns.

The peers emphasise that with modern tools and technology, colour-vision is no longer an important ability even in chemistry 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 needlessly restrictive and ask UPI not to apply it in the future, should it still be in place.

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

The peers thank UPI particularly for commenting on the MC curriculum and on the admission of people with colour-blindness. They acknowledge that the university is currently revising the learning outcomes and the module descriptions of the MC programme to ensure that it consistently reflects master level. The reworked module description that UPI has provided as an example already marks an improvement, although the university should take care that the verbs used in the course learning outcomes appropriately describe the competences that are to be achieved. For instance, it is unclear what "analysing laws of thermodynamics" could mean as opposed to "understanding the laws of thermodynamics". The peers also note that one of the learning outcomes of the MC programme is to "make a

proper decision to solve problems based on the existing data and information, following social ethics and values, humanities, and nationalism". They stress that nationalism as an ideological concept is not suitable to make good decisions in a scientific context, although this may be an issue of translation.

Until this revision process has been completed and the revised documents have been presented, the peers adhere to their preliminary assessment.

They understand from UPI's statement that applicants with colour-blindness are indeed not admitted to the chemistry programmes under review. They are aware that this is common practice at Indonesian universities, but they are nonetheless convinced that it is unnecessary. Therefore, they appreciate that UPI plans to move towards a more inclusive admission system and emphasise that UPI must not exclude students from admission on the grounds of colour-blindness.

Consequently, the peers consider criterion 1 partly fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-assessment reports
- Study plans of the degree programmes
- Module descriptions
- Academic handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The curricula of all bachelor's degree programmes under review are designed for eight semesters. How many credit points the students can take depends on their GPA in the previous semester. The amount ranges from 16 credit points for students with a GPA below 2.5 to 24 credit points for those with a GPA above 3.5. Therefore, outstanding students are able to complete the bachelor's degree in less than 4 years. However, this case is rare since the workload of the undergraduate programmes is rather high and the curricula are designed for four years. MC is designed for four semesters and the students have to take only

around 10 credit points per semester on average. The students' individual study plans can be different from each other but have to be approved by their academic advisors. The curricula include theoretical and practical courses, thesis, community service, and electives.

After analysing the module descriptions and the study plans, the peers confirm that all degree programmes under review are divided into modules and that each module is a sum of coherent teaching and learning units. All programmes allow the students to define individual focuses through broad ranges of electives (see the lists of electives in the appendix). In summary, the peers gain the impression that the choice of modules and the structure of the curricula ensure that the intended learning outcomes of the degree programmes can be achieved.

The students explain that the structure of the programmes allows most of them to reach the learning outcomes within the regular duration. This is corroborated by data provided by UPI, which demonstrates that the majority of students finish their bachelor programmes in eight semesters (for MC, no data is yet available). At the same time, only very few students do not successfully finish their studies in the programmes at hand. In the peers' opinion, this shows the sound organisation of the programmes as well as sufficient means of support for the students (see chapter 2.4). On the other hand, there is a significant number of students who need 9 semesters to finish their studies. Based on the discussions with students and teaching staff, the peers are convinced that this is mostly due to the final project, where they see the need to cover the effective workload more appropriately by credit points (see chapter 2.2).

International Mobility

The self-assessment report as well as the discussions make it very clear that international recognition is one of UPI's primary goals for the next years. The peers point out that international mobility, with regard to the lecturers as well as to the students, is a key factor in these efforts.

The peers learn that the university already provides various mobility opportunities for students. These include semesters abroad, short programmes, internships, and international conferences. To foster these, there are cooperation agreements with many partner institutions worldwide, with a focus on Southeast Asia, but also including institutions in Europe and North America. An international office has been established in order to coordinate UPI's efforts and to support the students in the planning and administration of international mobility. Moreover, the university provides scholarships for international mobility programmes, albeit only for short-term programmes up to one month due to a limited budget.

Qualifications obtained at other universities in Indonesia or abroad are recognised in line with the courses at UPI. Before a stay abroad, the university concludes a learning agreement with the respective student to ensure that the courses taken are relevant to the study programme and can thus be recognised. As the students confirm, there are no problems with credit transfer or the organisation of student mobility. They emphasise that the international office as well as their academic advisors are eager to support them and to find adequate study programmes and courses.

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 pursue activities and acquire credits outside their bachelor's programme for up to three semesters (Minister of Education and Culture Regulation Number 3 Year 2020). UPI recognises the courses taken by the students outside the university based on the equality of the intended learning outcomes. The peers consider this regulation sufficient.

The peers appreciate the efforts undertaken by the university to foster student mobility and they are satisfied with the structures and support mechanisms for international mobility.

Criterion 2.2 Workload 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 degree programmes under review use a credit point system called SKS. According to the legal requirements, an undergraduate programme in Indonesia can have between 144 and 160 SKS and a graduate programme has to include at least 36 SKS. The bachelor's programmes under review encompass between 145 and 150 SKS, while the master's programme has 42 SKS.

1 SKS of academic load is equivalent to 170 minutes per semester week. For lectures, tutorials and similar classes, this means 50 minutes of face-to-face activity, 60 minutes of structured tasks and 60 minutes of independent learning per semester week, whereas for laboratory work, thesis and internships, 1 SKS equals 170 minutes of the respective activity per

semester week. Details about the workload of each course are given in the module descriptions. Regarding the conversion from SKS to ECTS, UPI explains that 1 SKS equals 45.3 hours and thus 1.62 ECTS, based on 28 hours per ECTS. The peers acknowledge that a credit point system based on the students' workload is in place.

The workload is spread relatively evenly over the semesters, each semester usually containing 19-21 SKS in the bachelor programmes and 15 to 17 SKS in MC, with the exception of the final semester in the bachelor programmes and the final two semesters in MC. In MC, the third and fourth include courses with only 2 and 8 SKS respectively, in the bachelor programmes, the final semester contains courses with 10 SKS (thesis and internship). For the peers, this nominally low workload during the time allocated for the final thesis already hints at the fact that the credit points awarded for the thesis do not adequately cover the students' actual workload. During the discussions, both students and teaching staff explain that most students need at least six months for their bachelor's thesis. Some even need considerably more time, particularly when they encounter problems during data collection, which is given as one of the most prominent reasons why students need an additional semester to finish their studies. This clearly shows that the workload of the bachelor's thesis is much higher than the allotted 272 hours (6 SKS). For the master's thesis in MC, comparable information is not yet available, but the usual difference in scope and scientific character between a bachelor's and a master's thesis combined with the requirements to present the results of the master's thesis at a conference and to publish them in an international journal already make clear that the designated 8 SKS (362 hours) are insufficient to cover this workload. Consequently, the peers urge UPI to ensure that the credit points awarded for the thesis correspond with the actual workload of the students.

Apart from the thesis, the peers cannot detect any obvious problems with the workload and the students confirm that it is generally manageable. However, at the moment there are no mechanisms in place to inquire how much time the students effectively spend for each individual course. The peers consider it important that the allocated time for individual studying and learning reasonably corresponds with the students' effective workload. Therefore, they recommend that the university establish a systematic monitoring of the student workload for the individual modules. This could, for instance, be done within the existing course evaluation surveys.

Criterion 2.3 Teaching methodology

Evidence:

- Self-assessment report

- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The teaching and learning methods employed in each course are laid down in the module descriptions. Through the Indonesian regulations on credit points (see chapter 2.2), a balance between face-to-face activities and independent learning is ensured for all courses. In the programmes under review, various student-centred learning methods are utilised. Besides the regular lectures, problem-based learning, small projects, case studies, and flipped classroom are used to a considerable degree. The students confirm that these methods are actually used in the courses and that they are highly satisfied with the variety of teaching methods, which support them in achieving the learning outcomes. Teaching and learning are supported by a broad range of media, both traditional (books, papers) and online (videos, presentations etc.). The university's online learning management system supports teachers and students in communicating and disseminating learning material. During the Covid-19 pandemic, the university has swiftly switched to online learning with videoconferences, experiments that can be done at home, tutorial videos and through other means.

The peers see that practical laboratory work is included in many courses and discuss with teaching staff and students how this is implemented in practice. They learn that the experiments are normally done in groups of three students. Before conducting the experiments, students have to pass a short test to ensure that they have the necessary knowledge to handle the equipment. After an explanation by the lecturer, students conduct the experiments on their own while being supported by laboratory staff and have to hand in reports afterwards.

The peers consider the teaching methods employed in the degree programmes to be diverse and to support reaching the learning outcomes. They are well adapted to the aims and conditions of the individual courses.

Criterion 2.4 Support and assistance

Evidence:

- Self-assessment report
- Website
- Discussions during the audit

Preliminary assessment and analysis of the peers:

In order to support students in completing their studies in time with good achievements, the university and the faculty provide academic and personal support and assistance through various means. The main contact person for every student is their academic advisor, who is assigned to them in their first semester. An academic advisor shall help them develop an adequate schedule for their studies, choose electives according to their skills and interests and support them in case of academic and non-academic problems. The academic advisor also has to approve the student's study plan for the semester. As this might lead to conflicts, the peers inquire about what mechanisms are in place to solve such conflicts. They learn that students can contact the head of their study programme or of the department and that academic advisors can be changed in case of grave conflicts, but students as well as lecturers emphasise that there are usually no such conflicts. Furthermore, there is supporting staff in the International Office (see chapter 2.1), the career centre and the general academic administration.

The peers conclude that there are enough resources available to provide individual assistance, advice, and support for all students. The support systems help the students to achieve the intended learning outcomes to complete their studies successfully.

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

The peers thank UPI for commenting on the student workload concerning the final thesis in MC. They emphasise that their comments refer not only to the master's thesis but also to the bachelor's thesis in the other programmes where the mismatch between workload and the allotted credit points is quite evident. On the one hand, they understand that national regulations may be an issue and that courses on research methods and literature review are helpful to prepare students for working on their theses. On the other hand, UPI has to find ways to allocate an amount of credit points to the final theses that adequately covers the student workload. Adding additional courses for the preparation of a proposal or for the presentation/defense of the thesis may help with this.

The peers consider criterion 2 partly fulfilled.

3. Exams: system, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-assessment report
- Module descriptions
- Academic handbook
- Exam regulations
- Sample exams and final theses

Preliminary assessment and analysis of the peers:
For the examination of the students' achievement, each course has to determine objectives, which support the achievement of the overall learning outcomes of the respective programme. Accordingly, each course must assess whether all defined learning outcomes stated in the module description have been achieved. For this purpose, UPI utilises various types of examination.

In most courses, at least two assignments/quizzes, a mid-term and a final examination are employed. Mid-term and final exam are written tests, while for the additional quizzes or assignments other assessment methods such as oral presentations, discussions etc. can be used. The types of assessment are specified in the module descriptions. Students are informed about mid-term and final exams via the academic calendar. The final grade is the result of the different activities in the course (e.g., mid-term exam, final exam, quizzes, or other given assignments).

If a student fails, she or he usually has to repeat the entire module in the following year; it is usually not possible to retake just parts of the course 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 such as illness or a scheduling conflict. Some courses allow students whose grades are still below the passing level to improve their grades through repeating an exam. For students with disabilities, compensation measures have been established to allow them to participate in the exams on an equal footing. These measures include giving them more time, using alternative forms of assessment, or creating a relaxed assessment atmosphere.

The peers discuss with the students about the exams and the exam organisation and learn that they are well informed about the examination schedule, the examination form, and

the rules for grading. Students are satisfied with the variety of examination methods and have enough time to adequately prepare for the exams.

Every student in the programmes under review is required to do a final project (bachelor's/master's thesis). This project is conducted independently under the guidance of two supervisors and usually consists of literature study, practical research, and data analysis. Both the student and his or her supervisors might propose the topic and content of the project. In many cases, the lecturers offer particular topics connected to their research. The final thesis is presented in front of a group of examiners in seminar format. It is also possible to conduct an external final project, e.g., in cooperation with a company. In this case, one co-supervisor comes from the respective company. The results of the master's thesis have to be published in an international Scopus-indexed journal.

Overall, the peers are satisfied with the regulation of exams in the degree programmes. They also inspect a sample of examination papers and bachelor's theses and are satisfied with their general quality.

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

As UPI does not comment on this criterion, the peers uphold their preliminary assessment. They consider criterion 3 fulfilled.

4. Resources

Criterion 4.1 Staff

- Self-assessment report
- Staff handbooks
- Study plans
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:
At UPI, the staff members have different academic positions. There are professors, associate professors, assistant professors, and lecturers. 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 partly depend on the academic position.

According to the Self-Assessment Report, the teaching staff of BC consists of 24 full-time teachers (15 with a PhD, 9 with a master's degree). For BCE, there are 22 lecturers (15 with a PhD, 7 with a master's degree), for BP 14 (12 with a PhD, 2 with a master's degree) and for BPE 27 (13 with a PhD, 14 with a master's degree), while 14 staff members are teaching in MC (all with a PhD). The current teacher to student ratio is 1:11 for BC, BP and BCE, 1:13 for BPE, and 2:1 for MC (as mentioned, the number of students in MC is still very low), which are all good ratios by international standards. Students and teachers confirm that there are enough laboratory technicians to look after the technical equipment and to support the students in their practical work.

All full-time 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.

The peers notice that a high fraction of the staff members have no international experience and no publishing record in reputable international journals and discuss with the responsible persons how they evaluate this situation. UPI representatives explain that strengthening the lecturers' international experience and research is an important priority of the university. In the past, lecturers were encouraged to publish a high number of articles, with no regard to peer-review or the impact factor of journals, which has contributed to the present situation. However, UPI changed its strategy to incentivise publications in Q1 and Q2 journals and to bolster research collaborations with international partners. The peers appreciate this change of strategy and highly encourage the university to pursue this path further by supporting high-quality research and encouraging staff to pursue further qualification internationally.

Most of the lecturers in physics focus on experimental and applied physics, with a special concentration in materials science. On the other hand, there is only one person with a research interest in theoretical physics and consequently, basic courses in theoretical physics are also covered by lecturers specialising in other areas. The situation is similar for computational physics. While the peers do not see this as an urgent problem, they recommend that UPI hire more lecturers in theoretical and computational physics, thereby providing a better coverage of the courses in these areas and opening the opportunity to establish research groups in these fields.

For BCE and BPE, the peers discuss with the university about whether lecturers have some teaching experience in high schools. As UPI elaborates, some of them have this kind of ex-

perience and it plays a role in the selection process for teaching staff in education programmes. Further cooperation with high schools takes place through a programme funded by the government where lecturers give some classes in schools and through joint research projects/final theses. Concerning the collaboration with industry and external research institutes, UPI sometimes invites guest lecturers from these fields, but – as it appears to the peers – only relatively rarely. The peers appreciate these efforts, but notice during the discussion with external stakeholders that there is a strong interest to intensify cooperation with UPI, not only from high schools, but also from companies and research institutions. Hence, they encourage the university to expand the cooperation with industry, research institutions and schools, be it through research projects or through making better use of opportunities to include guest lecturers into the teaching.

Overall, the peers confirm that the composition, scientific orientation, and qualification of the teaching staff are suitable for successfully implementing and sustaining the degree programmes.

Criterion 4.2 Staff development

Evidence:

- Self-assessment report
- Staff handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:
UPI encourages training of its academic and technical staff for improving their scientific and didactic abilities and teaching methods. As described in the self-assessment reports, faculty members and non-academic staff regularly participate in training or workshops. Every year, the heads of departments and study programmes map the competences of their staff, analyse organisational needs for continuous improvement, and make plans for annual work programmes in line with the faculty's and university's strategic plans.

To this end, UPI has established several programmes to support staff development. New staff members are required to undertake an intensive basic training programme. For established faculty members, there are English trainings, workshop to improve scientific capabilities, lecturer exchange programmes (domestic and abroad), and various didactic training opportunities (microteaching, learning management systems e-learning etc.). Lecturers are encouraged and incentivised to conduct high-quality research and to participate in international research projects (see chapter 4.1). The teaching load of lecturers can be reduced to give them the necessary time to pursue extensive research projects. For junior

teaching staff, study permits and funding opportunities are provided to pursue a PhD degree, preferably abroad.

The peers appreciate the university's efforts in this regard and consider the support mechanisms for the continuing professional development of the teaching staff adequate and sufficient.

Criterion 4.3 Funds and equipment

Evidence:

- Self-assessment report
- Videos and presentation of the facilities
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The university and the faculty are mainly funded by the Indonesian government, through tuition fees and through grants for research projects in collaboration with industry. The figures presented by the university show that the faculty's income is stable and the operation of the degree programmes is secured.

In preparation of the audit, the university provides a number of videos showing the laboratories of the programmes. During the virtual on-site visit, the facilities of all programmes are shown in more detail. The peers notice that the lecture rooms are well equipped. The university has teaching as well as research laboratories for physics and chemistry that feature basic as well as some advanced equipment. However, UPI emphasises that it is difficult to obtain sophisticated equipment due to the high cost. Therefore, the university cooperates with other universities and research institutions in the surrounding area, particularly with the nearby Institut Teknologi Bandung as one of Indonesia's foremost research universities. Given limited budgets, the peers understand that sharing resources is a valid strategy, especially for bachelor programmes, where such equipment is not needed on a regular basis. This strategy has its limitations, however, with regards to master programmes such as MC (and the master programmes in physics education and chemistry education as well as the planned one for physics that are outside the scope of this accreditation report). For MC in particular, acquiring additional equipment for some analytical instrumentation such as NMR would be very useful. In general, acquiring additional advanced equipment to be used in research as well as in master and potential future PhD programmes would be a crucial step towards implementing UPI's strategy to strengthen its research profile. Therefore, the peers recommend developing a clear roadmap for these

acquisitions, which would be very beneficial especially for master programmes, and providing the necessary funding for them.

The peers cannot make a final assessment of the quality of the technical equipment and the infrastructure on the basis of the provided videos alone. Not all laboratories are shown in the videos and particularly the safety measures remain partly unclear. While the peers acknowledge that there is clearly an awareness for health and safety issues, that health and safety instructions are held and that personal protection items are used under certain circumstances, they cannot get a complete picture of the safety precautions, which are vital particularly in chemistry laboratories. This concerns for instance the consistent use of safety goggles and gloves, the availability of eye showers, chemical-proof cabinets, and details of the ventilation system (general air exchange rates, fume hoods). Therefore, the peers point out that it is necessary to assess the technical infrastructure, safety measures, and facilities onsite at UPI. This will be done by at least one expert and one ASIIN programme manager in order to ensure that the required safety standards are met.

Each department has a computer laboratory that students can use for studying. High-performance computers, which may be needed particularly for final projects, are available in the computational physics laboratory and in UPI's central facilities.

The students also express their satisfaction with the library and the available literature there. The library has subscribed to several international online resource collections such as Emerald, IEEE, SAGE, and SpringerLink. Additionally, students can access the virtual resources of the Indonesian national library. Access to the library resources is provided through VPN.

In summary and despite the mentioned room for improvement, the peer group judges the available funds, the technical equipment, and the infrastructure to comply with the requirements for an adequately sustainability of the degree programmes.

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

The peers thank UPI for providing additional information on safety measures in the laboratories that are used in the programmes under review. However, they still see the necessity to assess the facilities and the technical infrastructure onsite to get a complete picture of the situation (e.g. fume hoods, ventilation, labelling systems for hazardous substances, use of PPA and safety documentation routines).

The peers consider criterion 4 partly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-assessment report
- Module descriptions
- Website of the department for chemistry education: http://kimia.upi.edu/
- Website of the department for physics education: http://fisika.upi.edu/
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The module handbooks for all programmes have been published on the university's website and are thus accessible to the students as well as to all stakeholders. The peers observe that they contain information on all important issues, that is, responsible persons, the intended learning outcomes, the credit points awarded, the workload, the main content, prerequisites, examinations, and recommended literature. However, the formulation of course learning outcomes in many cases does not adequately reflect the skills which the students should have acquired, but rather describes the content of the courses or the activities conducted within them. This way, there is barely a difference between "content" and "learning outcomes". Hence, UPI should rework the module descriptions to convey accurate information on these two categories. In doing so, it is important to use keywords in accordance with Bloom's taxonomy in order to precisely describe the students' competences. Furthermore, the literature recommended for some modules is quite old (1970s/1980s) and therefore does not always reflect the current state of knowledge in the respective subjects. UPI should ensure that the recommended literature is always up to date.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-assessment report
- Sample diploma 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 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 transcript of records lists all the courses that the graduate has completed, the achieved credits, grades, and cumulative GPA. The diploma supplement contains information about the degree programme including acquired soft skills and awards (extracurricular and co-curricular activities). However, it currently does not inform about the distribution of grades within the student cohort, which is necessary so that potential employers can properly evaluate a student's grade. Therefore, UPI has to add this statistical data.

Criterion 5.3 Relevant rules

Evidence:

- Self-assessment report
- All relevant regulations as published on the university's websites

Preliminary assessment and analysis of the peers:
The peers confirm that the rights and duties of both UPI and the students are clearly defined and binding. All rules and regulations are published on the university's Indonesian website and hence available to all stakeholders. However, they are currently not available on the department's websites, where students and other stakeholders might look for them first. Therefore, the peers would appreciate if UPI provided them on the department's websites as well. The students receive all relevant course material in the instruction language of the degree programme at the beginning of each semester.

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

The peers thank UPI for declaring the intention to improve the module handbooks with regards to the points that have been addressed in this report. Until this has been done, they adhere to their preliminary assessment. Moreover, they point out that the diploma supplements need to be reworked to include comparative information on the grade distribution in the student cohort.

The peers consider criterion 5 partly fulfilled.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- Internal quality assurance regulations
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The peers discuss the quality management system at UPI with the programme coordinators and the students. They learn that there is a continuous process to improve the quality of the degree programmes and it is carried out through internal and external quality assurance (QA) and that the quality management system is based on clearly elaborated structures and mechanisms involving all stakeholders.

The rector overlooks quality assurance which is carried out by the Quality Assurance Unit (SPM) and the faculty leaders of UPI. At faculty level, the SPM coordinates the implementation of QA with the heads of the study programmes.

At the department or study programme level QA is carried out by the Quality Control Group (GKM). SPM carries out annual internal quality audits (AMI) based on UPI AMI guidelines and annual study programme performance reports (self-evaluation reports) prepared by the respective head of the study programme together with the GPM. The reports address measurement data, identified problems and their causes, preventive and corrective actions planned related to educational standards, research, community service and student affairs. Two internal auditors assigned by SPM visit each study programme to ensure conformity between the report and the implementation of activities. The results are discussed in a management review meeting to plan follow-up actions, which are re-evaluated during the next internal audit. Related to the educational standards, each study programme reports its achievements twice a year (mid-year, year-end report), coordinated by the faculty to be reported to the Directorate of Planning and Development at university level. Faculty and university leaders use the evaluation results to improve the performance of the study programmes. Related to the research and community service, the Institute for Research and Community Service periodically carries out quality assurance by asking researchers to report on their research or community service activities and through reporting mechanisms (annual progress and final reports).

At individual (lecturer) basis, lecturers update their curriculum vitae every year and make a workload report every semester reported to UPI and submitted to the Directorate General of Higher Education after being validated by two assessors. All lecturers make a plan for employee performance targets, which becomes part of the SKP assessment, together with an assessment of employee work behaviour (criteria are service orientation, integrity, commitment, discipline, cooperation, leadership).

Apart from internal quality assurance, the programmes regularly undergo external quality assurance measures such as the obligatory accreditation by the National Accreditation Board for Higher Education (BAN PT) carried out every five years. In the latest accreditations, BC, BCE and BPE obtained the highest grade A, while BP and MC received a B. The faculty has also undergone an ISO 9001: 2015 certification.

Course and lecturer performance evaluation is carried out each semester, based on well-defined criteria. The results of these course evaluation surveys go to the respective lecturer as well as the head of the respective department. In case of deficiencies of the lecturers' teaching skills or methods, the teaching staff is encouraged to improve, for instance by attending pedagogical training. The students feel that their feedback is taken seriously and necessary measures are taken. Nevertheless, the peers see that the results of the satisfaction surveys are currently not systematically discussed with the students. They would like UPI to devise a clear process of how these results and possible improvement measures can be communicated to and discussed with the students, so that the feedback loops are closed.

Overall, the peers confirm that the quality management system at UPI is appropriately designed to regularly identify weaknesses and to take corrective actions in order to continuously improve the degree programmes.

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

The peers thank UPI for providing information on the planned improvements and encourage the university to properly implement these in the future.

They consider criterion 6 fulfilled.

D Additional documents

Before preparing their final assessment, the panel asks 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:

D 1. Are applicants with total or partial colour-blindness excluded from admission into any of the programmes under review?

E Comment of the Higher Education Institution (07.02.2022)

The following quotes the comment of the institution:

"Thank you very much for your report of 20 January 2022 and its recommendations. All study programmes in the natural science cluster graciously accept the accreditation report. We greatly appreciate your positive comments and valuable suggestions for the improvement of study programmes in the natural science cluster to meet the international standard. In general, the assessment delivered by the ASIIN peers complies with the evidence provided in both SAR documents and visitation activities. The accreditation report has been circulated among the stakeholders in the study programme, faculty, and university. In particular, we comprehensively discuss the assessment results and recommendation points that we take into account for the quality improvement in this institution.
Regarding the report, all study programmes committed to following up all recommendation points as follows:

1. To improve the learning outcomes, especially by reformulating the LO corresponding to social competences (interdisciplinary collaboration) and generic skills (IT, entrepreneurship), also synchronizing the learning outcomes between different study programmes. Therefore, coherence between similar study programmes can be guaranteed.
2. To improve modules (updating the content, learning methods, and references) through the revision of modules that will be conducted within this year and revision of curriculum within these five years following the university regulation.
3. To improve lecturers' expertise and students' learning experience through the teaching internship, teaching industry, visiting professor programme. In the case of theoretical physics, the BP programme has proposed to the faculty/university to recruit a new lecturer with the expertise on theoretical physics.
4. To provide advanced facilities gradually (within this year, the university will be purchasing the Scanning Electron Microscope that can be accessible and required to support the research activities for both students and lecturers). Hopefully, soon NMR and other advanced facilities can be provided by the university.
5. To be more inclusive in the university admission system by providing equal opportunities for those with disabilities, especially for colour blind cases (partially and totally), to apply in all study programmes in the university. This commitment will be

proposed to the university to be included in the admission regulation and followed by providing disabled facilities for conducting academic and research activities.

6. To improve the exam system by issuing Standard Operating Procedure (SOP) of exam that accommodates all possible cases experienced by students who cannot attend the exam. In particular, the detailed procedures of the exam will be listed in the module handbook.
7. To ensure the lecturers have a proportional working load by regulating teaching schedule and lecturer-to-student ratio.
8. To provide the feedback of students' satisfactory survey more transparent and properly by utilizing website/social media of study programme and organizing a forum with students to inform and discuss the survey results as well as the responses of study programme toward students' complaints, comments or suggestions.

Nevertheless, we still found some factual errors in the accreditation report. The corrections are as follows:

1. The MC programme has two intakes every year, February and September. The odd semester is from September to January, while the even semester is from February to June. In particular, the short semester is conducted from July to August.
2. The English version of the vision and mission of each study programme provided on the website has been revised (http://kimia.upi.edu/prodi/program-pendidikan-kimia/; http://kimia.upi.edu/prodi/program-kimia/; http://kimia.upi.edu/prodi/magister-kimia/; https://fisika.upi.edu/akademik/pendidikan-fisika/; https://fisika.upi.edu/akademik/fisika/)
3. Regarding the international experience of the staff member as stated in the accreditation report p.24, We confirm that all lecturers in BP and MC programmes have international publications, while only 4%, 8%, and 7% of lecturers of BCE, BC, and BPE respectively who have not yet published in an international journal. However, the study programme strongly encourages all lecturers to publish their research in a reputable international journal by providing a coaching clinic on writing papers for international journals and finding a research grant, also providing incentives.

Furthermore, we provide the required additional information as follows:

1. The code of conduct of lecturers, staff, and students have been added to the website of each study programme (http://kimia.upi.edu/pedoman-akademik/; https://fisika.upi.edu/unduhan/)
2. In general, similar to UPI, most national universities apply the colour blindness policy in the admission system as mentioned in these links:
   https://selma.ub.ac.id/prodi-yang-wajib-mengunggah-surat-keterangan-buta-warna-pada-daftar-ulang-snmptn-2019/
   https://penerimaan.ui.ac.id/id/period/requirement/261

https://www.unpad.ac.id/2020/08/ini-ketentuan-registrasi-bagi-calon-mahasiswa-baru-sarjana-jalur-mandiri-unpad/
https://www.its.ac.id/news/2019/06/21/waspadai-kondisi-buta-warna-ketika-daftar-di-its/
https://admission.itb.ac.id/home/faq/program-sarjana

3. Since three study programmes in the natural science cluster just received the national reaccreditation results, the new decrees are listed as follow:

Study programme	Accreditation rank	Decree
Physics Education	A	5945/SK/BAN-PT/Ak-PPJ/S/VI/2021
Chemistry Education	A	12848/SK/BAN-PT/Ak-PPJ/S/XII/2021
Master of Chemistry	B	14056/SK/BAN-PT/Akred/M/XII/2021

4. Regarding the lab facilities, we provide additional information on safety measures that are available through this link (https://drive.google.com/drive/folders/1pyfQ1-MjrfJmVlX3Nqi5lWG42zGb29DJ?usp=sharing). We hope this information can clarify the safety facilities provided by the study programme.

In addition, here we would like to clarify some issues of the MC programme. We are committed to improving the learning outcomes by revising them, upgrading the generic skill and social skills, and synchronizing the LOs with the relevant course at the bachelor's degree programme. The revised LOs will be covered in the revised modules. The modules are being revised in terms of contents, including the depth and breadth of the contents, ensuring they become more advanced. The modules will be synchronized with the relevant course in the bachelor's degree programme, making them more aligned with level 8 of KKNI and distinguishing them from the subjects at the bachelor's level.

For example, here we enclose the modification on module content of "Selected Topics in Physical Chemistry".

	Before	After
Description	Selected Topics in Physical Chemistry is a mandatory course on	Selected Topics in Physical Chemistry is a mandatory course from

	MKKIPS course group. This course was designed to improve student understanding on fundamental and applied aspects of physical chemistry, as well as exploring the pedagogical consequences of related topic. Course is also oriented to improve students higher order thinking skill on assessing physical chemistry content for application on related chemical concepts and industrial aspects. This course would discuss selected topics on gas, chemical thermodynamics, phase equilibrium, multicomponents systems, and chemical kinetics. Through this course, students are expected to have deeper understanding of gas, chemical thermodynamics, multicomponents system, and chemical kinetics. Lectures will be conducted through historical, conceptual and contextual approach, and employing conventional lecture, discussion, and problem solving's method. Final marks will be composed of assignments (20%), unit test 1 (25%), unit test 2 (25%), and final exam (30%).	MKKIPS course groups. This course was designed to bridged student's knowledge on physical chemistry from the bachelor level to specific courses on material chemistry and biological chemistry. With this course, students are expected to reinforce their knowledge on fundamental concepts chemical kinetics and thermodynamics, as well as a wider knowledge on the application of chemical kinetics and thermodynamics on material chemistry and biological chemistry. This course contents include selected topics on properties of liquids and solutions, Solid State Thermodynamics, Reaction Dynamics and Chemical Kinetics, as well as Thermodynamics and Kinetics of Biological Systems. Lecture conducted using historical and conceptual approach, and delivered contextually using expository, discussion, problem solving, individual and group assignments. Evaluation is performed using unit test, final exam, and portfolio. Final mark is composed of assignments (30%), unit test (30%), and final exam (40%).
CLOs	• Understands properties of gases and laws describing it. • Understands laws of thermodynamics and their applications in thermochemistry • Understands fundamental aspects of chemical kinetics and their applications • Apply didactical and pedagogical principles to taught chemical concepts through the context of physical chemistry.	• Analysing properties of fluids and related laws • Analysing Laws of Thermodynamics and applying on the field of material and biological chemistry • Analysing theories of chemical kinetic and its application is reactor design and biological system • Work independently or collaboratively to solve a particular problem.

	• Work independently or collaboratively to solve a particular problem.	
References	1. Levin, I.N., Physical Chemistry, 6th Edition, McGraw-Hill, New York, 2009. 2. Atkins, P.W., Physical Chemistry, Third Edition, Oxford University Press, 1986. 3. Barrow, G.M., Physical Chemistry, Fourth Edition, McGraw-Hill, Tokyo, 1971 4. Related websites. 5. Steinfeld, J. I., Francisco, J. S., and Hase, W. L., Chemical Kinetics and Dynamics, Second Edition, Prentice-Hall, Inc., New Jersey, 1999.	1. Murrell, J.N., and Jenkins, A.D., Properties of Liquids and Solutions, 2nd Edition, John Wiley and Sons, New York, USA, 1994. 2. Sherwood, D. and Dalby, P., Modern Thermodynamics for Chemists and Biochemists, Oxford University Press, United Kingdom, First Edition, 2018. 3. Swalin, R.A, Thermodynamics of Solid, 2nd Edition, John Wiley and Sons, New York, USA, 1972. 4. Hammes, G, G, Thermodynamic and Kinetics for the Biological Sciences, John Wiley and Sons, New York, USA, 2000. 5. Houston, P. L., Chemical Kinetics and Reaction Dynamics, McGraw-Hill, Singapore, 2001. 6. Griskey, R. G., Chemical Engineering for Chemists, American, Chemical Society, USA, 1997. 7. Relevant Journal

While the lecture syllabi are modified as follows:

Week	Before		After	
	Content	Reference	Content	Reference
1	Ideal gas and real gases	1-4	Intermolecular Forces and Models of Fluid State	1, 2, 7
2	Fundamentals, 0th and 1st Laws of thermodynamics	1-4	Thermodynamics Properties of Pure Fluids and Non-electrolyte Mixture	1, 2, 7
3	Enthalpy and Laws of Thermochemistry	1-4	Polar Liquids and Aqueous Electrolyte Solutions	1, 2, 7
4	Review and discussions	1-4	Chemical Equilibrium and Solution of Polymer	1, 2, 7
5	Carnot Cycle, 2nd and 3rd Laws of Thermodynamics	1-4	Unit test 1	

6	Gibbs Free Energy and Equilibrium	1-4	Chemical Reaction and Phase Transformation Thermodynamics	2, 3, 7
7	Review and Discussion	1-4	Excess Quantity and Thermodynamics of Alloy System	2, 3, 7
8	Midterm exam		Interface and Surface Thermodynamics	
9	Phase diagrams and Gibbs Phase Rule	1-4	Application of Thermodynamics on Biological Systems	2, 4, 7
10	Thermodynamics of solutions	1-4	Unit test 2	
11	Modern models for ion in solutions	1-4	Chemical Reaction Theories	5, 7
12	Thermodynamics of electrochemical cells	1-4	Reaction in Solutions	5, 7
13	Fundamentals of chemical kinetics and Arrhenius equation	1-5	Application of Chemical Kinetics on Reactor Design	6, 7
14	Chemical kinetics of complex reactions	1-5	Application of Chemical Kinetics on Biological System	4, 7
15	Phenomenological theory of chemical kinetics	1-5	Unit test 3	
16	Final exam			

The similar approaches will be applied for improvement of other modules as well as syllabi in MC programme as mentioned above.

The curriculum applied for the master's level becomes a remarkable issue for the team responsible for curriculum development. Hence, the revision of the curriculum will be conducted as a long-term follow up for the improvement of LOs and modules for the master's level. This will be taken into action at the earliest in 2025.

Regarding the working load of the final project, we agree that this activity requires more credits (to be > 8 credits). However, it's quite challenging to change the workload of the thesis due to the national curriculum mandate. Nevertheless, to ensure students workload on the final project, the MC programme provides other lectures that strongly support research preparation, academic writing, and data analysis. The lectures cover research methodology (2 credits) for preparation of research proposal; research review (2 credits) for literature review; and applied statistics (2 credits) for data analysis. Therefore, in total MC programme has 14 credits to facilitate students in completing the final project and student's working load on final project becomes more well distributed.

Finally, on behalf of UPI and ASIIN cluster A team, we would like to greatly appreciate the excellent guidance, valuable supports and suggestions provided by ASIIN Panel experts in all accreditation activities."

F Summary: Peer recommendations (18.02.2022)

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Physics	With requirements for one year	30.09.2027	--	--
Ba Chemistry	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ba Physics Education	With requirements for one year	30.09.2027	--	--
Ba Chemistry Education	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ma Chemistry	With requirements for one year	30.09.2027	Euromaster® upon the fulfilment of requirements	--

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Ensure that the credit points awarded for the thesis correspond with the actual workload of the students.

A 2. (ASIIN 4.3) It is necessary to visit and assess the technical infrastructure, safety measures, and facilities onsite at UPI.

A 3. (ASIIN 5.1) Rewrite the module descriptions to include accurate information about the content, learning outcomes and recommended current literature for each course.

A 4. (ASIIN 5.2) Ensure that the Diploma Supplements contain comparative information on the grade distribution in the student cohort.

A 5. (ASIIN 1.4) UPI must not exclude students from admission on the grounds of colour-blindness.

For the Master's degree programme Chemistry

A 6. (ASIIN 1.3) Ensure that the courses consistently reach the level of a Master's degree programme and build upon competences achieved at the Bachelor's level. This has to be reflected in the module descriptions.

Recommendations

For all degree programmes

E 1. (ASIIN 1.1) It is recommended to better match the learning outcomes of the different degree programmes, particularly regarding general and social competences.

E 2. (ASIIN 2.2) It is recommended to establish a system to monitor the actual student workload in the individual courses.

E 3. (ASIIN 4.1) UPI's current strategy to focus on research and higher quality publications instead of mere quantity is appreciated and it is highly recommended to pursue this further.

E 4. (ASIIN 4.3) In the context of strengthening the faculty's research, it is strongly recommended to provide more funding and to develop a clear roadmap to acquire advanced equipment, particularly for the existing and planned Master's and PhD programmes.

E 5. (ASIIN 4.1) It is recommended to hire more teaching staff in physics, particularly covering theoretical and computational physics, thereby opening the opportunity to establish research groups in these fields.

E 6. (ASIIN 4.1) It is recommended to further strengthen the cooperation with high schools, industry and external research institutes in terms of educational and scientific research and to make better use of opportunities to include guest lecturers from these areas into the teaching.

E 7. (ASIIN 5.3) It is recommended to make all relevant rules and regulations more easily accessible for the students by providing them on the department website.

E 8. (ASIIN 6) It is recommended to devise a clearer process of how the results of the student satisfaction surveys on all levels and the possible improvements are communicated to and discussed with the students.

G Comment of the Technical Committees

Technical Committee 09 – Chemistry, Pharmacy (01.03.2022)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure and emphasises that it is inappropriate to exclude colour-blind students per se from a degree programme and that the university must change the relevant regulations. This point should be considered in all accreditation procedures with Indonesian universities. However, the TC suggests a slight rewording of the relevant requirement.

Assessment and analysis for the award of the Eurobachelor®/Euromaster® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes comply with the fields of knowledge set by ECTN.

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Chemistry	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ba Chemistry Education	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ma Chemistry	With requirements for one year	30.09.2027	Euromaster® upon the fulfilment of requirements	--

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Ensure that the credit points awarded for the thesis correspond with the actual workload of the students.

A 2. (ASIIN 4.3) It is necessary to visit and assess the technical infrastructure, safety measures, and facilities onsite at UPI.

A 3. (ASIIN 5.1) Rewrite the module descriptions to include accurate information about the content, learning outcomes and recommended current literature for each course.

A 4. (ASIIN 5.2) Ensure that the Diploma Supplements contain comparative information on the grade distribution in the student cohort.

A 5. (ASIIN 1.4) UPI must not exclude students from admission because of colour-blindness.

For the Master's degree programme Chemistry

A 6. (ASIIN 1.3) Ensure that the courses consistently reach the level of a Master's degree programme and build upon competences achieved at the Bachelor's level. This has to be reflected in the module descriptions.

Recommendations

For all degree programmes

E 1. (ASIIN 1.1) It is recommended to better match the learning outcomes of the different degree programmes, particularly regarding general and social competences.

E 2. (ASIIN 2.2) It is recommended to establish a system to monitor the actual student workload in the individual courses.

E 3. (ASIIN 4.1) UPI's current strategy to focus on research and higher quality publications instead of mere quantity is appreciated and it is highly recommended to pursue this further.

E 4. (ASIIN 4.3) In the context of strengthening the faculty's research, it is strongly recommended to provide more funding and to develop a clear roadmap to acquire advanced equipment, particularly for the existing and planned Master's and PhD programmes.

E 5. (ASIIN 4.1) It is recommended to hire more teaching staff in physics, particularly covering theoretical and computational physics, thereby opening the opportunity to establish research groups in these fields.

E 6. (ASIIN 4.1) It is recommended to further strengthen the cooperation with high schools, industry and external research institutes in terms of educational and scientific research and to make better use of opportunities to include guest lecturers from these areas into the teaching.

E 7. (ASIIN 5.3) It is recommended to make all relevant rules and regulations more easily accessible for the students by providing them on the department website.

E 8. (ASIIN 6) It is recommended to devise a clearer process of how the results of the student satisfaction surveys on all levels and the possible improvements are communicated to and discussed with the students.

Technical Committee 13 – Physics (09.03.2022)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and concurs with the assessment of the peers.

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Physics	With requirements for one year	30.09.2027	--	--
Ba Physics Education	With requirements for one year	30.09.2027	--	--

H Decision of the Accreditation Commission (18.03.2022)

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

The Accreditation Commission discusses the procedure and concurs with the assessment of the peers.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Physics	With requirements for one year	30.09.2027	--	--
Ba Chemistry	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ba Physics Education	With requirements for one year	30.09.2027	--	--
Ba Chemistry Education	With requirements for one year	30.09.2027	Eurobachelor® upon the fulfilment of requirements	--
Ma Chemistry	With requirements for one year	30.09.2027	Euromaster® upon the fulfilment of requirements	--

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Ensure that the credit points awarded for the thesis correspond with the actual workload of the students.

A 2. (ASIIN 4.3) It is necessary to visit and assess the technical infrastructure, safety measures, and facilities onsite at UPI.

A 3. (ASIIN 5.1) Rewrite the module descriptions to include accurate information about the content, learning outcomes and recommended current literature for each course.

A 4. (ASIIN 5.2) Ensure that the Diploma Supplements contain comparative information on the grade distribution in the student cohort.

A 5. (ASIIN 1.4) UPI must not exclude students from admission on the grounds of colour-blindness.

For the Master's degree programme Chemistry

A 6. (ASIIN 1.3) Ensure that the courses consistently reach the level of a Master's degree programme and build upon competences achieved at the Bachelor's level. This has to be reflected in the module descriptions.

Recommendations

For all degree programmes

E 1. (ASIIN 1.1) It is recommended to better match the learning outcomes of the different degree programmes, particularly regarding general and social competences.

E 2. (ASIIN 2.2) It is recommended to establish a system to monitor the actual student workload in the individual courses.

E 3. (ASIIN 4.1) UPI's current strategy to focus on research and higher quality publications instead of mere quantity is appreciated and it is highly recommended to pursue this further.

E 4. (ASIIN 4.3) In the context of strengthening the faculty's research, it is strongly recommended to provide more funding and to develop a clear roadmap to acquire advanced equipment, particularly for the existing and planned Master's and PhD programmes.

E 5. (ASIIN 4.1) It is recommended to hire more teaching staff in physics, particularly covering theoretical and computational physics, thereby opening the opportunity to establish research groups in these fields.

E 6. (ASIIN 4.1) It is recommended to further strengthen the cooperation with high schools, industry and external research institutes in terms of educational and scientific research and to make better use of opportunities to include guest lecturers from these areas into the teaching.

E 7. (ASIIN 5.3) It is recommended to make all relevant rules and regulations more easily accessible for the students by providing them on the department website.

E 8. (ASIIN 6) It is recommended to devise a clearer process of how the results of the student satisfaction surveys on all levels and the possible improvements are communicated to and discussed with the students.

I Fulfilment of Requirements (24.03.2023)

Analysis of the peers and the Technical Committees 09 – Chemistry, Pharmacy and 13 - Physics (15.03.2023)

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Ensure that the credit points awarded for the thesis correspond with the actual workload of the students.

Initial Treatment	
Peers	Fulfilled Vote: per majority Justification: The increase of credits was done by adding credits from preparatory modules located in previous semesters. However, our doubts mainly concerned the workload in the final semester and whether it is adequately represented by credit points. On the other hand, the report indicates that taking into account preparatory courses could be acceptable to find a solution compatible with national regulations. In this sense, one might consider the implemented solution as acceptable.
TC 09	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.
TC 13	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

A 2. (ASIIN 4.3) It is necessary to visit and assess the technical infrastructure, safety measures, and facilities onsite at UPI.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: During the follow-up visit, the peers were able to verify that sufficient security measures are in place. In addition, UPI demonstrated that it had sufficient modern equipment to sustain its degree programs.
TC 09	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.
TC 13	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

A 3. (ASIIN 5.1) Rewrite the module descriptions to include accurate information about the content, learning outcomes and recommended current literature for each course.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: Based on random samples in the module handbooks BP and BPE, efforts to improve the module entries are evident. However, there is still room for improvement. For »Basic Physics I« (BP) "Analyze the base concepts of" is schematically prepended in front of items from the content. For »Mathematical Physics I« (BP), the learning outcomes are thematically given in much more detail than the content. The same holds for »Fundamentals of Physics I« (BPE). For »Calculus« (BPE), "have ability to" is systematically prepended, so that the range of competences is not made use of. If one understands the work on the module handbooks as an ongoing process, the module handbooks for BP and BPE seem more or less acceptable at this point. But there definitely remains room for further improvement.
TC 09	fulfilled Vote: unanimous

	Justification: The TC discusses the procedure and agrees with the assessment of the expert group.
TC 13	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

A 4. (ASIIN 5.2) Ensure that the Diploma Supplements contain comparative information on the grade distribution in the student cohort.

Initial Treatment	
Peers	fulfilled Vote: unanimous Justification: The Diploma Supplement now contains the necessary information.
TC 09	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.
TC 13	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

A 5. (ASIIN 1.4) UPI must not exclude students from admission on the grounds of colour-blindness.

Initial Treatment	
Peers	Fulfilled Vote: unanimous Justification: In section B.b. on page 3, the third point referring to colour blindness was removed as compared to the previous year.
TC 09	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.
TC 13	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

For the Master's degree programme Chemistry

A 6. (ASIIN 1.3) Ensure that the courses consistently reach the level of a Master's degree programme and build upon competences achieved at the Bachelor's level. This has to be reflected in the module descriptions.

Initial Treatment	
Peers	Fulfilled Vote: unanimous Justification: The contents of the modules in BC and MC now differ sufficiently.
TC 09	fulfilled Vote: unanimous Justification: The TC discusses the procedure and agrees with the assessment of the expert group.

Decision of the Accreditation Commission (24.03.2023)

The Accreditation Commission discusses the procedure and follows the assessment of the peers and the expert committees.

Having taken into consideration the assessment of the expert panel and the relevant Technical Committees, the Accreditation Commission took the following decision:

Degree programme	**ASIIN-label**	**Subject-specific label**	**Accreditation until max.**
Ba Physics	All requirements fulfilled		30.09.2027
Ba Physics Education	All requirements fulfilled		30.09.2027
Ba Chemistry	All requirements fulfilled	Eurobachelor®	30.09.2027
Ba Chemistry Education	All requirements fulfilled	Eurobachelor®	30.09.2027
Ma Chemistry	All requirements fulfilled	Euromaster®	30.09.2027

Appendix: Programme Learning Outcomes and Curricula

According to the website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor's degree programme Physics:

Codes of PLO	Description of PLO
Subject-specific competences	
BP-1	Understanding theoretical concepts and main principles of classical and modern physics.
BP-2	Understanding principles and applications of mathematical physics, computational physics, instrumentation, also insights into language and education.
BP-3	Competent in research methodology and technique of data analysis in physics.
BP-4	Able to formulate the physics features and problems through analysis based on observation and experiment results.
BP-5	Able to provide the model of physics systems and to solve the problems by mathematics and computing facilities.
BP-6	Able to analyze various alternative solutions to physics problems and conclude them to make the right decisions.
Generic competences	
BP-7	Possess literacy, critical and creative thinking, communication and collaboration skills in mathematics, science, technology, and engineering to solve various problems in an integrated and/or multidisciplinary manner.
BP-8	Able to work together and develop networking.
BP-9	Able to write the results of scientific studies in the form of theses and / or other scientific reports and publish them.
BP-10	Able to integrate learning outcomes and innovation and become lifelong learners to adapt to advances in science and technology.
Social competences	
BP-11	Become a citizen who believes and has devotion to God Almighty; proud and love the homeland; and have good morals, ethics and personality.
BP-12	Demonstrate a responsible attitude, a spirit of independence, struggle, and entrepreneurship.

The following **curriculum** is presented:

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
MKU		**14**	**16**	**4**			**2**	**2**		
KU100	Islamic Education	2	2							
KU101	Protestant Christianity Education	2	2							
KU102	Catholic Education	2	2							
KU103	Hinduism Education	2	2							
KU104	Buddhism Education	2	2							
KU109	Confucianism Education	2	2							
KU105	Civic Education	2	2							
KU106	Indonesian Language	2	2							
KU108	Sports Education	2		2						
KU110	Pancasila Education	2		2						
KU119	Art Education	2		2						
KU300	Islamic Education Seminar	2					2			
KU301	Protestant Christianity Education Seminar	2					2			
KU302	Catholic Education Seminar	2					2			
KU303	Hinduism Education Seminar	2					2			
KU304	Buddhism Education Seminar	2					2			
KU309	Confucianism Education Seminar	2					2			
KU400	Community Service	2						2		
MKKU		**2**		**2**						
HU300	Introduction to Education	2		2						
MKKF		**6**	**3**	**3**						
MA100	STEM	3	3							
MA200	STEM Application	3		3						
MKKPL/SP		**4**								**4**
FI591	Working Practice Interval	4								4
MKKIPS		**96**								

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
Basic Physics		**21**	**6**	**6**	**4**	**3**			**2**	
FI121	Fundamentals of Physics 1	4	4							
FI223	Fundamentals Physics Experiments 1	2	2							
FI122	Fundamentals of Physics 2	4		4						
FI224	Fundamentals Physics Experiments 2	2		2						
FI342	Optics	2			2					
FI343	Fluid Physics	2			2					
FI140	Fundamental Concepts of Earth and Space	3				3				
FI381	History of Physics	2							2	
Electromagnetism		**12**			**3**	**7**	**2**			
FI241	Analog Electronics	3			3					
FI344	Electromagnetism	4				4				
FI441	Digital Electronics	3				3				
FI460	Wave and Electromagnetism Experiments	2					2			
Modern Physics		**22**	**22**				**8**	**10**		
FI360	Modern Physics	4					4			
FI560	Quantum Physics	4					4			
FI461	Computational Physics	4					4			
FI561	Solid State Physics	4						4		
FI462	Modern Physics Experiments	2						2		
FI562	Nuclear Physics	4						4		
Supplementary		**4**	**2**	**2**						
FI220	English	2	2							
FI221	Entrepreneurship	2		2						
Thermodynamics and Statistical Physics		**6**			**3**				**3**	
FI341	Thermodynamics	3			3					
FI580	Statistical Physics	3							3	
Tools fo Physics		**23**	**3**	**4**	**4**	**3**		**3**	**6**	
FI120	Fundamentals of Mathematics	3	3							
FI222	Mathematical Physics 1	4		4						

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
FI240	Mathematical Physics 2	4			4					
FI242	Algorithm and Programming	3				3				
FI563	Research Methodology and Scientific Publication	3						3		
FI481	Physical Modeling and Simulation	3							3	
FI581	Physics Seminar	3							3	
Wave and Classical Mechanics		**8**			**4**	**4**				
FI340	Classical Mechanics	4			4					
FI345	Wave	4				4				
MKKPPS		**17**								
FI346	Physics of Volcanoes	2			2					
FI347	Information and Communication Technology	2			2					
FI348	Electrical Circuit Analysis	2				2				
FI349	Control and Automation	2				2				
FI361	Geophysical Geology	3					3			
FI362	Space Physics	3					3			
FI363	Material Physics	3					3			
FI364	Metrology and Calibration	3					3			
FI501	Celestial Mechanics	2						2		
FI502	Industrial Instrumentation	2						2		
FI503	Geomechanics of Rocks and Soils	2						2		
FI504	Superconductor	2						2		
FI505	Space Weather and Meteorology	2						2		
FI564	Geophysical Exploration	3						3		
FI565	Astrophysics	3						3		
FI566	Physics of Semiconductor Device	3						3		
FI567	Instrumentation System	3						3		
FI582	Geophysical Data Analysis	3							3	
FI583	Geothermal Physics	2							2	
FI584	Astronomical Position	2							2	
FI585	Stellar Physics	3							3	
FI586	Nanomaterial	2							2	

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
FI587	Processing and Characterization of Semiconductor Material	3							3	
FI588	Intelligent Instrumentation	2							2	
FI589	Microprocessor Application	3							3	
THESIS		**6**								**6**
FI598	Thesis	6								6
FI599	Defense Exam	0								0
TOTAL CREDITS		**145**								

According to the website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor's degree programme Physics Education:

Codes of PLO	Description of PLO
Subject-specific competences	
BPE-1	Understanding of the concepts, principles, laws and theories of physics.
BPE-2	Competent in the concepts, principles, and application of mathematics, statistics, electronics, computational physics, and language to support learning process in physics.

BPE-3	Competent in the learning theory, the concepts of the curriculum in the physics teaching and learning, methods and learning strategy in physics, lesson plan of physics, development of teaching material, media, assessment, and development of physic laboratory tools at schools.
BPE-4	Competent in research methodology in physics education, laboratory management for teaching and learning in physics, and entrepreneurial concepts.
BPE-5	Able to make a set of physics teaching materials independently using scientific rules and instructional design analysis of pedagogical content knowledge, following the curriculum, scientific approach, application of science and technology and environment; conduct learning following the content and student's characters to develop student thinking skills and scientific attitude.
BPE-6	Able to figure out, analyze, and solve the problems related to the teaching process in physics and laboratory management following the applied scientific rule; propose alternatives of problem solutions to make a proper decision; be lifelong learners who are independent and readily adapt to change.
BPE-7	Able to analyze the learning process reflectively for the quality improvement of the physics learning process; conduct research using qualitative and quantitative approaches to solve the problems and evaluate the results of the learning process; write scientific reports for further publications.
Generic competences	
BPE-8	Possess literacy, critical and creative thinking, communication and collaboration skills in mathematics, science, technology, and engineering to solve various problems in an integrated and/or multidisciplinary manner.
BPE-9	Able to apply logical, critical, systematic, and innovative thinking in developing and implementing science and technology by emphasizing the character value related to the expertise.
BPE-10	Able to work independently, qualified, measurable, critical, and creative; maintain networking; make proper decisions in addressing the problems based on analytical data and information.
Social competences	
BPE-11	Become a citizen who believes and has devotion to God Almighty; proud and love the homeland; and have good morals, ethics and personality.
BPE-12	Demonstrate a responsible attitude regarding the work related to the expertise; internalize the spirit of independence, struggle, and entrepreneurship; have a commitment to elaborate trait and capability based on local wisdom; have the motivation to do good for the people's sake.

The following **curriculum** is presented:

Code	Course Group	Credits	Semester							
			1	2	3	4	5	6	7	8
MKU		**14**	**16**	**4**			**2**	**2**		
KU100	Islamic Education	2	2							
KU101	Protestant Christianity Education	2	2							
KU102	Catholic Education	2	2							
KU103	Hinduism Education	2	2							
KU104	Buddhism Education	2	2							
KU109	Confucianism Education	2	2							
KU105	Civic Education	2	2							
KU106	Indonesian Languange	2	2							
KU108	Sports Education	2		2						
KU110	Pancasila Education	2		2						
KU119	Art Education	2		2						
KU300	Islamic Education Seminar	2					2			
KU301	Protestant Christianity Education Seminar	2					2			
KU302	Catholic Education Seminar	2					2			
KU303	Hinduism Education Seminar	2					2			
KU304	Buddhism Education Seminar	2					2			
KU309	Confucianism Education Seminar	2					2			
KU400	Community Service	2						2		
MKKF		**6**	**3**	**3**						
MA100	STEM	3	3							
MA200	STEM Application	3		3						
MKKPL/SP		**4**								**4**
FI590	Working Practice Interval	4								4
MKDK		**8**	**2**	**2**	**2**	**2**				
DK300	Fundamentals of Education	2		2						
DK301	Psychology of Education and Counseling	2	2							
DK303	Curriculum and Learning	2				2				

Code	Course Group	Credits	Semester							
			1	2	3	4	5	6	7	8
DK304	Education Management	2			2					
MKKPBS		**12**					**6**	**6**		
FI251	Physics Learning Strategy	3					3			
FI252	Physics Learning Media and ICT Literation	3						3		
FI253	Physics Learning Evaluation	3					3			
FI551	Physics Learning Planning	3						3		
MKKIPS		**80**								
Basic Physics		**15**	**6**	**6**	**3**					
FI112	Fundamentals of Physics I	4	4							
FI211	Fundamental Physics Experiments I	2	2							
FI113	Fundamentals of Physics II	4		4						
FI212	Fundamental Physics Experiments II	2		2						
FI132	Earth and Space	3			3					
Electromagnetism		**7**			**3**		**4**			
FI333	Electronics	3			3					
FI352	Electromagnetism	4					4			
Educations		**8**			**2**	**2**	**4**			
FI332	Classical Mechanics for School	2			2					
FI334	Thermodynamics and Wave Optics for School	2				2				
FI254	School Physics Laboratory	2					2			
FI351	Electromagnetism and Modern Physics for School	2					2			
Modern Physics		**13**					**4**	**3**	**6**	
FI353	Modern Physics	4					4			
FI554	Nuclear Physics	3						3		
FI571	Quantum Physics	3							3	
FI573	Solid State Physics	3							3	
Wave and Classical Mechanics		**8**				**8**				
FI335	Classical Mechanics	4				4				
FI337	Wave Optics	4				4				
Tools for Physics		**19**	**3**	**4**	**6**			**6**		

Code	Course Group	Credits	Semester							
			1	2	3	4	5	6	7	8
FI111	Calculus	3	3							
FI311	Mathematical Physics I	4		4						
FI131	Statistics	2			2					
FI331	Mathematical Physics II	4			4					
FI552	Physics Education Seminar	3						3		
FI553	Physics Education Research Methodology	3						3		
Supplementary		**4**		**2**					**2**	
FI213	English	2		2						
FI371	Entrepreneurship	2							2	
Thermodynamics and Statistical Physics		**6**				**3**			**3**	
FI336	Thermodynamics	3				3				
FI572	Statistical Physics	3							3	
MKKPPS		**16**								
FI338	Environmental Physics	2			2					
FI339	Physics Education Taxonomy	2			2					
FI431	Technology and Engineering is Physics Education	2			2					
FI432	Physics E-Learning	2						2		
FI433	ICT in Physics Education	2						2		
FI434	Applied Statistics for Education	2			2					
FI435	Practical Electronics	2			2					
FI436	Computational Physics	2				2				
FI531	Item Response Theory	2				2				
FI354	Physics Teaching Material Innovation	2				2				
FI355	History of Physics	2				2				
FI451	Wave and Electromagnetism Experiments *)	2						2		
FI452	Electronic Instrumentation and Measurement Technique	2						2		
FI574	Physics Education for Sustainable Development	2							2	
FI471	School Physics Laboratory Management *)	2							2	
FI472	Modern Physics Experiments	2				2				
FI575	Advance Nuclear Physics	2						2		
FI576	Advance Quantum Physics	2							2	

Code	Course Group	Credits	Semester							
			1	2	3	4	5	6	7	8
FI577	Advance Solid-State Physics	2							2	
FI578	Astrophysics	2							2	
FI338	Environmental Physics	2							2	
THESIS		**6**								
FI598	Thesis	6								
FI599	Defense Exam	0								
TOTAL CREDITS		**146**								

According to the website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor's degree programme Chemistry:

Codes of PLO	Description of PLO
Subject-specific competences	
BC-1	Have gained chemistry relevant knowledge of mathematics and natural sciences.
BC-2	Have gained in-depth and well-balanced knowledge of essential concepts on inorganic, organic, analytical, physical chemistry, and biochemistry.
BC-3	Have gained knowledge of concepts and principles on environmental, material, food, and bioorganic chemistry as well as their applications on a selected field.
BC-4	Be able to work independently by implementing occupational health and safety concepts and regulations in the laboratory, environment, and industry.

BC-5 Be able to utilize standard methodologies to solve chemistry-related problems and their implementation in other contexts and situations.

BC-6 Have gained chemistry-related skill and knowledge on business and management.

Generic competences

BC-7 Be able to plan and carry out research as a scientific investigation to solve a problem independently and present it as a scientific work.

BC-8 Be able to obtain, process, interpret, and evaluate scientific data and draw a meaningful conclusion by considering scientific and technological aspects as well as scientific ethics.

Social competences

BC-9 Be able to communicate with colleagues from the related field and general public on chemistry-related contents and problems, and use the foreign language in a cross-cultural frame as a lifelong learner.

BC-10 Have gained knowledge of chemistry-related professional standards, principles and ethics and exhibit responsible attitudes for work in their field.

BC-11 Be able to work independently or as a part of a team.

BC-12 Have gained social skills and knowledge as well as responsible attitudes and leaderships and implement them in a professional setting.

The following **curriculum** is presented:

Course Code	Group of courses	Credits	Semester							
			1	2	3	4	5	6	7	8
MKU		**14**	**6**	**4**			**2**	**2**		
KU100	Islamic Education	2	2							
KU101	Protestant Christianity Education	2	2							
KU102	Catholic Education	2	2							
KU103	Hinduism Education	2	2							
KU104	Buddhism Education	2	2							
KU109	Confucianism Education	2	2							
KU105	Civic Education	2	2							
KU106	Indonesian Language	2	2							
KU108	Sports Education	2		2						
KU110	Pancasila Education	2		2						
KU119	Art Education	2		2						
KU300	Islamic Education Seminar	2					2			
KU301	Protestant Christianity Education Seminar	2					2			
KU302	Catholic Education Seminar	2					2			
KU303	Hinduism Education Seminar	2					2			
KU304	Buddhism Education Seminar	2					2			
KU309	Confucianism Education Seminar	2					2			
KU400	Community Service	2						2		
MKKU		**2**		**2**						
HU300	Introduction to Education	2		2						
MKKF		**6**	**3**	**3**						
MA100	STEM	3	3							
MA200	STEM Application	3		3						
MKKPL/SP		**4**								**4**
KI590	Working Practice Interval (Internship)	4								4

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Course Code	Group of courses	Credits	Semester							
			1	2	3	4	5	6	7	8
MKKIPS		**99**	**12**	**9**	**20**	**20**	**18**	**20**		
Basic for Chemistry		**10**	**8**	**2**						
KI101	Fundamentals of Chemistry 1	3	3							
KI102	Fundamentals of Chemistry 2	3	3							
KI202	Basic Laboratory Skills	2	2							
KI203	Fundamental Chemistry Experiments	2		2						
Physical Chemistry		**18**			**5**	**7**	**4**	**2**		
KI303	Chemical Bonding and Structure	3				3				
KI304	Gas, Thermodynamics and Phase Equilibrium	3			3					
KI309	Chemical Kinetics	2			2					
KI314	Thermodynamics of Multi-components System	2				2				
KI324	Computational Chemistry	2					2			
KI405	Physical Chemistry Experiments	2				2				
KI323	Nuclear Chemistry and Radiochemistry	2					2			
KI505	Polymer Chemistry	2						2		
Analytical Chemistry		**12**		**3**	**4**	**5**				
KI305	Fundamentals of Analytical Chemistry	3		3						
KI310	Separation Chemistry	2			2					
KI406	Fundamentals Analytical Chemistry Experiments	2			2					
KI410	Chemical Separation and Measurement Experiments	2				2				
KI503	Instrumental Analytical Chemistry	3				3				
Inorganic Chemistry		**13**			**3**	**3**	**5**	**2**		
KI307	Structure and Reactivity of Inorganic Compounds	3			3					
KI316	Coordination Chemistry	3					3			
KI408	Inorganic Chemistry Experiments	2					2			
KI318	Organometallic Chemistry	2						2		
KI312	Chemistry of Transition and Main Group Elements	3				3				
Organic Chemistry		**17**		**4**	**4**	**2**	**7**			
KI306	Structure and Reactivity of Monofunctional Organic Compounds	4		4						
KI311	Structure and Reactivity of Polyfunctional Organic Compounds	2			2					

Course Code	Group of courses	Credits	Semester							
			1	2	3	4	5	6	7	8
KI315	Organic Synthesis	2				2				
KI317	Natural Product Chemistry	2					2			
KI407	Identification and Purification of Organic Compounds Experiments	2			2					
KI504	Elucidation of Organic and Inorganic Compounds Structure	3					3			
KI411	Synthesis and Isolation of Organic Compounds Experiments	2					2			
Biochemistry		**9**				**3**	**2**	**4**		
KI308	Structure and Function of Biomolecule	3				3				
KI313	Biomolecule Metabolism and Genetic Information	2					2			
KI409	Biochemistry Experiments	2						2		
KI506	Biotechnology	2						2		
Supplementary		**4**	**2**		**2**					
KI200	English	2	2							
KI201	Entrepreneurship	2			2					
Introduction to Applied Chemistry		**10**						**10**		
KI319	Introduction to Environmental Chemistry	2						2		
KI320	Introduction to Food Chemistry	2						2		
KI321	Introduction to Material Chemistry	2						2		
KI322	Introduction to Biological Chemistry	2						2		
KI325	Chemical Industry Process	2						2		
Tools for Chemistry		**6**	**2**		**2**			**2**		
KI337	Statistics for Chemistry	2			2					
KI339	Research Methodology	2						2		
KI100	Mathematics for Chemistry	2	2							
MKKPPS		**16**							**16**	
Biological Chemistry		**16**								
KI522	Essential Oil Chemistry	3							3	
KI523	Separation and Characterization of Natural Product Compounds	3							3	
KI524	Molecular Genetics	3							3	
KI525	Selected Topic in Biological Chemistry	3							3	

Course Code	Group of courses	Credits	Semester							
			1	2	3	4	5	6	7	8
KI526	Biological Chemistry Research Techniques	2							2	
KI533	Biological Chemistry Seminar	2							2	
Environmental Chemistry		**16**							**16**	
KI507	Water Treatment	3							3	
KI508	Waste Treatment	3							3	
KI509	System and Design of Waste Treatment	2							2	
KI510	Environmental Toxicology	2							2	
KI511	Environmental Chemistry Analysis	2							2	
KI527	Waste and Water Treatment Experiments	2							2	
KI530	Environmental Chemistry Seminar	2							2	
Food Chemistry		**16**								
KI512	Food Regulation	2							2	
KI513	Food Sensory Evaluation	2							2	
KI514	Food Chemistry	2							2	
KI515	Food Preservation	2							2	
KI516	Food Processing	2							2	
KI517	Health and Nutrition	2							2	
KI528	Food Processing and Technology Experiments	2							2	
KI531	Food Chemistry Seminar	2							2	
Material Chemistry		**16**								
KI518	Solid State Chemistry	3							3	
KI519	Selected Topic in Material Chemistry	2							2	
KI520	Surface Chemistry	3							3	
KI521	Chemistry and Nanotechnology	3							3	
KI529	Material Synthesis and Characterization	3							3	
KI532	Material Chemistry Seminar	2							2	
THESIS		**6**								**6**
KI598	Thesis	6								6
KI599	Defense Exam	0								
TOTAL CREDITS		**147**								

According to the website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor's degree programme Chemistry Education:

Codes of PLO	Description of PLO
Subject-specific competences	
BCE-1	Have gained chemistry relevant knowledge of mathematics and natural sciences.
BCE-2	Have gained in-depth and well-balanced knowledge of essential concepts on inorganic, organic, analytical, and physical chemistry as well as biochemistry.
BCE-3	Have gained knowledge in applied chemistry.
BCE-4	Able to work independently by applying the Occupational Health and Safety (OHS) regulation in the laboratory, environment, and industry.
BCE-5	Able to apply scientific methods in chemistry and chemistry education.
BCE-6	Have gained theories of fundamental learning of pedagogical content knowledge.
BCE-7	Have skills in planning, applying, and assessing ICT based chemistry learning process.
Generic competences	
BCE-8	Able to make a proper decision based on the analysis of data and information by considering scientific finding, technology and ethics.
BCE-9	Able to plan and to carry out research to solve the problems in chemistry education.
BCE-10	Have gained fundamental knowledge to work, continue study, and be a lifelong learner.

Social competences	
BCE-11	Able to communicate across cultures and languages with chemistry education communities related to research and other scientific studies.
BCE-12	Able to apply the standard, principle, and professional ethics in chemistry and chemistry education.
BCE-13	Able to work individually or collectively to improve the working network concerning the diversity of cultures, religions, and way of life.
BCE-14	Have the knowledge and social skills, responsibility, and leadership as provisions for entering work.

The following **curriculum** is presented:

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
MKU		**14**		**4**			**2**	**2**		
KU100	Islamic Education	2	2							
KU101	Protestant Christianity Education	2	2							
KU102	Catholic Education	2	2							
KU103	Hinduism Education	2	2							
KU104	Buddhism Education	2	2							
KU109	Confucianism Education	2	2							
KU105	Civic Education	2	2							
KU106	Indonesian Language	2	2							
KU108	Sports Education	2		2						
KU110	Pancasila Education	2		2						
KU119	Art Education	2		2						
KU300	Islamic Education Seminar	2					2			
KU301	Protestant Christianity Education Seminar	2					2			
KU302	Catholic Education Seminar	2					2			
KU303	Hinduism Education Seminar	2					2			
KU304	Buddhism Education Seminar	2					2			
KU309	Confucianism Education Seminar	2					2			
KU400	Community Service	2						2		
MKKF		**6**	**3**	**3**						
MA100	STEM	3	3							
MA200	STEM Application	3		3						
MKKPPL/SP		**4**								**4**
KI590	Working Practice Interval	4								4
MKDK		**8**	**2**	**2**		**4**				
DK300	Fundamentals of Education	2	2	2						
DK301	Psychology of Education and Counseling	2								
DK303	Curriculum and Learning	2				2				

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Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
DK304	Education Management	2				2				
MKKPBS		**12**			**6**		**3**	**3**		
KI326	Chemistry Learning Strategy	3			3					
KI327	Chemistry Learning Evaluation	3			3					
KI328	Chemistry Learning Media and ICT Literation	3					3			
KI329	Chemistry Learning Planning	3						3		
MKKIPS		**84**	**9**	**11**	**14**	**16**	**13**	**11**	**10**	
Basic For Chemistry		**10**	**5**	**5**						
KI101	Fundamentals of Chemistry 1	3	3							
KI102	Fundamentals of Chemistry 2	3		3						
KI202	Basic Laboratory Skills	2	2							
KI203	Fundamental Chemistry Experiments	2		2						
Physical Chemistry		**12**		**6**	**2**	**4**				
KI303	Chemical Structure and Bonding	3		3						
KI304	Gas, Thermodynamics and Phase Equilibrium	3		3						
KI309	Chemical Kinetics	2			2					
KI314	Thermodynamics of Multi-components System	2				2				
KI405	Physical Chemistry Experiments	2				2				
Analytical Chemistry		**12**			**5**	**2**	**5**			
KI305	Fundamentals of Analytical Chemistry	3			3					
KI310	Separation Chemistry	2				2				
KI406	Fundamentals Analytical Chemistry Experiments	3					3			
KI410	Chemical Separation and Measurement Experiments	2			2					
KI503	Instrumental Analytical Chemistry	2					2			
Inorganic Chemistry		**11**			**3**	**3**	**3**	**2**		
KI307	Structure and Reactivity of Inorganic Compounds	3			3					
KI312	Chemistry of Transition and Main Group Elements	3				3				
KI316	Coordination Chemistry	3					3			
KI408	Inorganic Chemistry Experiments	2						2		

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
Organic Chemistry		**10**			**4**	**2**	**2**	**2**		
KI306	Structure and Reactivity of Monofunctional Organic Compounds	4			4					
KI311	Structure and Reactivity of Polyfunctional Organic Compounds	2					2			
KI407	Identification and Purification of Organic Compounds Experiments	2				2				
KI411	Synthesis and Isolation of Organic Compounds Experiments	2						2		
Biochemistry		**7**						**3**	**4**	
KI308	Structure and Function of Biomolecule	3						3		
KI313	Biomolecule Metabolism and Genetic Information	2							2	
KI409	Biochemistry Experiments	2							2	
Educations		**11**				**3**	**3**	**2**	**3**	
KI301	School Chemistry 1	3				3				
KI302	School Chemistry 2	3					3			
KI401	Multimedia Programming	2						2		
KI501	Chemistry Learning Simulation	3							3	
Tools for Chemistry		**7**	**2**					**2**	**3**	
KI336	Statistics for Chemistry Education Research	2	2							
KI338	Chemistry Education Research Methodology	3							3	
KI100	Mathematics for Chemistry	2						2		
Supplementary		**4**	**2**			**2**				
KI200	English	2	2							
KI201	Entrepreneurship	2				2				
MKKPPS		**16**								
KI319	Introduction to Environmental Chemistry	2						2		
KI320	Introduction to Food Chemistry	2						2		
KI321	Introduction to Material Chemistry	2						2		
KI322	Introduction to Biological Chemistry	2						2		
KI323	Nuclear Chemistry and Radiochemistry	2						2		
KI325	Chemical Industry Process	2						2		
KI330	Philosophy of Science and History of Chemistry	2					2			

Code	Group of Courses	Credits	Semester							
			1	2	3	4	5	6	7	8
KI331	School Chemistry Laboratory Management	2					2			
KI332	Junior and Senior High School Chemistry Learning and Curriculum	2						2		
KI334	Management of School Chemistry Teaching Material	2						2		
KI335	Training Management in Chemistry Education	2						2		
KI402	School Chemistry Experiment	2				2				
KI403	Production of Web Based Chemistry Teaching Material	2						2		
KI404	Production of Chemistry Learning Videos	2						2		
KI502	Development of School Chemistry Experiments	2						2		
THESIS		6								6
KI598	Thesis	6								6
KI599	Defense Exam	0								0
TOTAL CREDITS		150								

According to the website, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the master's degree programme Chemistry:

Codes of PLO	Description of PLO
Subject-specific competences	
MC-1	Have depth knowledge of the theory of structure, energetics, kinetics, analysis and synthesis of micro, macro and supramolecule and their applications.
MC-2	Able to apply chemistry in the research and development of the selected fields.
MC-3	Able to apply knowledge and skills to work professionally in chemistry, industrial chemistry, and other areas.
MC-4	Apply specific comprehension in material and biological chemistry to solve problems and manage related projects.
Generic competences	
MC-5	Able to develop logical and critical thinking, systematic, and creative to solve problems in chemistry and current issues independently through inter and multidisciplinary approaches.
MC-6	Able to make a proper decision to solve problems based on the existing data and information, following social ethics and values, humanities, and nationalism.
Social competences	
MC-7	Able to apply for scientific work independently in conducting and leading certain complex activities (including scientific publication).
MC-8	Able to apply scientific skills and social competences in sensibly managing and leading certain activities.

The following **curriculum** is presented:

Code	Course Group	Credits	Semester			
			1	2	3	4
MKKPs		**8**	**5**	**3**	**0**	**0**
PS701	Applied Statistics	3		3		
PS702	Philosophy of Science	2	2			
PS709	Chemistry Research Methodology	3	3			
MKKIPS		**14**	**10**	**4**	**0**	**0**
KI707	Selected Topics in Physical Chemistry	2	2			
KI711	Selected Topics in Organic Chemistry	2	2			
KI712	Selected Topics in Analytical Chemistry	2	2			
KI713	Selected Topics in Inorganic Chemistry	2	2			
KI723	Selected Topics in Biochemistry	2	2			
KI724	Computational Chemistry	2		2		
KI725	Characterization and Measurement in Chemistry	2		2		
MKKPPS		**12**	**2**	**8**	**2**	**0**
Biological Chemistry		**12**				
KI731	Functional Food Components	2		2		
KI732	Drug Molecule Synthesis	2		2		
KI733	Molecular Mechanism and Drug Biotransformation	2		2		
KI734	Medical and Nutritional Biochemistry	2		2		
KI735	Biological Chemistry Research Study	2			2	
KI736	Food and Drug Analysis	2	2			
Material Chemistry		**12**				
KI726	Material Design and Process	2	2			
KI727	Polymer Material	2		2		
KI728	Composite and Ceramic Materials	3		3		
KI729	Material Synthesis and Characterization	3		3		
KI730	Material Chemistry Research Study	2		3		
THESIS		**8**				**8**
KI799	Thesis	8				8
TOTAL CREDITS		**42**				