ASIIN Seal

Accreditation Report

Master's Degree Programmes
Engineering Physics
Materials and Metallurgical Engineering

Provided by
Institut Teknologi Sepuluh Nopember

Version: 21 December 2022

Table of Content

A About the Accreditation Process

Name of the degree program (in original language)	**(Official) English translation of the name**	**Labels applied for** [1]	**Previous accreditation (issuing agency, validity)**	**Involved Technical Committees (TC)**[2]
Magister Teknik Fisika	Master of Engineering Physics	ASIIN	/	05
Magister Teknik Material dan Metalurgi	Master of Materials and Metallurgical Engineering	ASIIN	/	05
Date of the contract: 19.01.2022 **Submission of the final version of the self-assessment report:** 01.07.2022 **Date of the onsite visit:** 12.10-14.10.2022 **Online**				
Peer panel: Prof. Dr. Anne Schulz-Beenken, South Westphalia University of Applied Sciences Prof. Dr.-Ing. Esther Held, University of Applied Sciences Emden/Leer Langgam Bagaspratoo, PT Fortasindo Nick Wisely, Student at ITB				
Representative of the ASIIN headquarter: Daniel Seegers				
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				

[1] ASIIN Seal for degree programs

[2] TC: Technical Committee for the following subject areas: TC 05 – Materials Science, Physical Technologies

Subject-Specific Criteria of Technical Committee 05 – Materials Science, Physical Technologies as of March 18, 2022	

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
Engineering Physics	Magister Teknik (M.T) / Master of Engineering (M. Eng.)	• Instrumentation Engineering • Renewable Energy Technology	7	Full time	/	2 years / 4 semesters	74 SKS equivalent to 118 ECTS	Every semester & 2008
Materials Science and Metallurgical Engineering	Magister Teknik (M.T) / Master of Engineering (M. Eng.)	• Materials and Materials Computation • Materials Selection and Application • Extractive Metallurgy and Materials Processing • Corrosion, NDT and Failure of Materials • Materials and Manufacturing Techniques	7	Full time	/	2 years / 4 semesters	73 SKS equivalent to 116 ECTS	Every Semester & 2012

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

For the Master's degree programme Engineering Physics (MoEP) the institution has presented the following graduate profile in its self-assessment report: graduates of the MoEP are expected to attain:

1. A reputation as an expert of innovative solutions to complex problem in the Engineering Physics field, in particular instrumentation engineering and renewable energy technology
2. Development in their professional career and progress toward an advanced degree
3. Leadership positions in their organization including academia and/or industry

For the Master's degree programme Materials and Metallurgical Engineering (MoMatE) graduates of the MoMatE will have the following competencies:

1. Graduates who are able to independently develop and apply their knowledge to solve problems within their professional practice using principles of materials science and metallurgical engineering

2. Graduates who have good moral personality and leadership with capabilities of communication, effective work in national and international contexts and doing continuous self-improvement

3. Graduates who are able to conduct investigations by means of analysis, modelling and experiments, including projects evaluation considering the social, ethical, ecological and economic implications as well as the basic requirements of the projects

C Peer Report for the ASIIN Seal

1. The Degree Program: Concept, content & implementation

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

Evidence:

- Self-assessment report
- Study plan per program
- Module descriptions per program
- Objectives-module-matrix per program
- Websites
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
The Institut Teknologi Sepuluh Nopember (ITS) has described and published program educational objectives (PEOs) and program learning outcomes (PLOs) for both degree programmes under review. While the PEOs are developed based on the vision and mission of the university as well as the respective faculty and are rather general, the PLOs describe in greater detail the competences the students should acquire during their studies. By means of being published on the websites of the degree programmes, the PEOs and PLOs are easily accessible for students as well as other stakeholders. Furthermore, there are regular revision processes in place that take into account feedback by external and internal stakeholders. Minor adjustments to the curriculum are made every semester whereas a major revision including consultations of stakeholders takes place every four years.

The peers note that the relationship between PEOs and PLOs has been established in a comprehensible and logical manner. The development of PLOs of the study programmes involves both internal and external stakeholders so that the curricula can be adapted and modified according to the needs of the industry and the graduates on a regular basis. For example, ITS conducts surveys, through which the different stakeholders get the chance to assess the programmes and their main objectives and adapt them if necessary. Internal

stakeholders include all of ITS members (students, teaching staff, and non-academic employees), while the external stakeholders include the industry, alumni, the government, and society.

At the end of their studies, graduates of the master's program Engineering Physics have acquired in depth comprehension of advanced mathematics, physics and engineering. They should be able to identify and develop appropriate methodologies as well as to analyze and to evaluate research and engineering data.

Graduates who have chosen the industrial instrumentation engineering specialization will also be able to develop innovative methods, skills and tools required for the development and optimization of measurement and control systems.

Graduates who have chosen the renewable energy engineering specialization will be able to develop innovative methods, skills and tools required for the development of optimization of renewable and sustainable energy systems.

Graduates of the master's program Materials and Metallurgical Engineering should be capable of mastering concepts, scientific principles, engineering principles, and factual knowledge about materials and metallurgical engineering to develop procedures and strategies needed in system analysis and design. They are able to formulate and solve problems and to produce system designs with new ideas in the field of materials science and metallurgy. They know how to compile scientific conceptions and research maps and to study results accordingly and have the capacity to develop various products.

Students can complete the programme in regular courses, but also have the option of completing the programme as a "Master by Research". This means that students attend less regular courses and prepare a variety of research concepts and projects during their studies. This version of the programme mainly focuses on the students' scientific experience and skills.

Next to the professional skills, the students of both programmes are supposed to acquire personal and social skills such as critical and creative thinking, communication skills, adaptability, the capacity to work in (international) teams, and leadership skills. In addition, they should be able to solve engineering problems through research and the application of different concepts and methods.

ITS points out that graduates of both programmes can work as engineers, project managers, in academia, as scientists or as technopreneurs within their respective fields.

In the peers' opinion, the objectives and learning outcomes of both degree programmes are clear, plausible and cover all aspects that can be expected from a program in the respective field. They learn that the graduates of ITS in general, and those of the engineering programmes in particular, are much sought after on the labor market. Moreover, many graduates of the master's degree programmes are employed as researchers/lecturers at various Indonesian universities. The representatives of industry emphasize the high quality of the graduates of both programmes under review and students as well as graduates are highly satisfied with and well aware of their very good job perspectives.

However, the representatives of the industry stress that some topics such as data analytics, programming and the overall concept of industry 4.0 could be deepened in order to respond appropriately to the ongoing changes in the labor market. The peers agree with this statement and recommend making sure that graduates will gain experience in the mentioned topics.

Another aspect raised by the students is their desire for more guidance on lifelong learning or learning how to learn, which coincides with the statement of the industry representatives and their analysis of a constantly and rapidly changing labor market. The peers agree that this is one of the key competences and therefore recommend evaluating how these skills are addressed over the course of the linked undergraduate and graduate programmes. They believe that while this skill is already required of graduates from bachelor's programmes, it can be further developed in master's programmes.

In summary, the peers confirm that both master's programmes adequately reflect level 7 of the European Qualification Framework (EQF). The program objectives and learning outcomes of both programmes are consistent with the respective ASIIN Subject-Specific Criteria of the Technical Committee Materials Science, Physical Technologies. They aim at the acquisition of specific competences and are well-anchored, binding and easily accessible to all stakeholders.

Criterion 1.2 Name of the degree program

Evidence:

- Self-assessment report

Preliminary assessment and analysis of the peers:
The titles of the degree programmes follow the rules for naming study programmes set by the Indonesian Ministry of Education and Culture. The expert panel considers the names of the study programmes to be adequately reflecting the respective aims, learning outcomes, and curricula.

Criterion 1.3 Curriculum

Evidence:

- Study plan per program
- Module descriptions per program
- Objective-module-matrix per program
- Discussions during the online audit

Preliminary assessment and analysis of the peers:

The curricula of both programmes are designed to comply with the program objectives and learning outcomes and are subject to constant revision processes (cf. chapter 1.1). Regular changes are made to ensure that the curricula are up to current requirements and adequately reflect the fast technological and scientific progress in the respective areas. In the self-assessment report and the curriculum for each program, ITS describes in detail how the PLOs of each program are to be achieved in the individual modules and thus explains the significance of each module for the program as a whole. The curricula are reviewed by the panel in order to identify whether the described learning objectives can be achieved by the available modules. Course descriptions as well as matrices matching the general learning objectives and the module contents were provided for a detailed analysis.

The master's degree programme MoEP contains advanced courses on mathematics, physics, and engineering to unify students' knowledge, as well as more specific courses within the specializations of Industrial Instrumentation Engineering (IIE) and Renewable Energy Technology (RET) that allow students to develop their own profile. Some examples are: "Advanced Instrumentation", "Signal Processing", and "Design Engineering" for IIE and "Energy Statistics", "Energy Conversion Technologies " and "Renewable Energy System" for RET. In addition, students can choose from a variety of electives to complete their choice of studies.

The master's degree programme MoMaTE offers regular courses as well as the possibility to study in the research track. It includes compulsory courses such as "Advanced Materials Characterization", Thermodynamics and Kinetics of Materials" or "Modelling of Materials Processing" that teach students in the core subject area. Additionally, the programme offers a wide range of elective modules. Within the research track of the study programme, students will mainly conduct research, i.e. they will deal with research design, scientific writing, data analyses as well as publishing short articles or their thesis in scientific journals.

The peers discuss with the university about how the students improve their English skills within the programmes. They learn that a certain score at an English test is necessary for graduation at ITS and the university employs several means to have the students reach the

needed level. Most of the textbooks are in English, there are some international guest lecturers, trainings for writing papers in English and there is a programme in which the lecturers learn how to teach in English. Since the students wish for even more opportunities to improve their English language proficiency, the peers recommend to keep up and deepen these efforts.

All in all, the peers have a very good impression of the curricula of both programmes. By thoroughly analyzing the module descriptions and following the discussions during the online visit, the peers state that both programmes are coherent, well-structured and cover the essential topics in the respective field, enabling also an individual profile building through various elective courses.

Criterion 1.4 Admission requirements

Evidence:

- Self-assessment report
- ITS and program websites
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
The student admission selection programme for graduate programmes at ITS is conducted once per semester. The admission is performed online.

Applicants must:

1. have obtained a bachelor's degree with a minimum GPA of 3.0 from a program accredited A or B by the national Indonesian accreditation agency
2. pass the entrance exam,
3. submit a letter of recommendation,
4. present a TOEFL certificate with a minimum score of 450 or comparable certificates (e.g. IELTS),
5. as well as an academic ability test certificate with a minimum score of 450 .

Students can improve their chances if they are able to propose a research topic for their thesis. However, as the peers learned during the audit, it is not mandatory to apply with an already defined thesis topic.

As the MoMatE programme can be studied as a Master by research, certain past achievements such as publications and research projects can be recognized.

The admission website informs potential students in great detail about the requirements and the necessary steps to apply for admission into the programmes. Since the rules are

based on decrees by the ministry of education and culture as well as on the university's written regulations, the peers deem them binding and transparent.

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

2. The degree program: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-assessment report
- Study plan per program
- Module descriptions per program
- Objective-module-matrix per program
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
Both master's programmes are designed for two years and the students need to achieve 74 and 73 SKS Indonesian Credit Points (around 115 ECTS) within two years. Each semester is equivalent to 16 weeks, including 14 weeks of learning activities and two weeks of examination (midterm and final exams).

The master's programme Materials and Metallurgical Engineering can be studied in one of two variants: Regularly as a Master by coursework, or as a Master by research. In the Master by coursework, students attend courses and complete them with regular exams. The Master by research comprises the same number of credits, but focuses on the scientific training of students in the field of materials and metallurgical engineering. Students are expected to carry out research that should lead to publications or patents. They will have the opportunity to improve their research methodology and choose elective courses, but will be predominantly engaged in research activities.

After analyzing the module descriptions and the study plans, the peers confirm that both degree programs are divided into modules and that each module is a sum of coherent teaching and learning units. Students are able to define individual focuses through broad ranges of electives. The students confirm that the structure of the program allows them to

reach the learning outcomes within the regular duration. This is corroborated by data provided by ITS, which demonstrates that the average study time is very close to the allocated four semesters.

The peers notice that there are a number of quite small modules with only 2-3 credit points. They learn that this is due to some regulation by ITS and the government and that it is common in Indonesia to have overall smaller modules compared to the German (or European) standard. Overall, the peers regard the module structure to be adequate, also because all students confirm that they are used to having smaller modules and that this does not have negative implications on the overall workload (see chapter 2.2 for more details).

The peers note that both programmes include 36 credits for "Additional Activities". Unable to identify the origin of these credits, they asked the programme coordinators to clarify what those credits are awarded for. They learned that "Additional activities" category is used to account for the additional workload of the students, when they give a presentations, work on a project or conduct a paper review. The peers appreciate that the additional workload of the students is reflected in the overall structure of the degree programmes.

The peers also discuss the practical experience of the students. The MoEP programme contains an internship (also called work experience). It is mandatory for all students to do a one-month internship, which may be extended up to six months. During the internship, the students are guided by two supervisors which are in close contact: one field supervisor in the company and one from the respective ITS department. The students highlight that the university is very supportive in finding placements for the internship and that they are always encouraged to gain as much practical experience as possible. However, the peers notice that there is broad consensus that a one-month internship is too short and thus often worthless, which is why most students extend it anyway. They therefore recommend extending the mandatory part of the internship to a minimum of three months in order to increase the utility of the internship for students as well as employers.

As the MoMatE programme does not include an internship, the peers recommend adding one to the curriculum in order to prepare students for their professional life and to complement their studies with practical experience.

International Mobility

The self-assessment report as well as the discussions make it very clear that international recognition is one of ITS's primary goals for the next years. The peers point out that international mobility, with regard to lecturers as well as 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 hundreds of partner institutions worldwide, with a certain focus on Asia, but also including many institutions in Europe and North America. Measured by the number of enrolled students, the peers consider the number of international students joining the programmes and the number of ITS students participating in international exchange to be quite high.

Qualifications obtained at other universities in Indonesia or abroad are recognized in line with the courses at ITS. 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 program and can thus be recognized. As the students confirm, there are no problems with credit transfer or the organization of student mobility. They emphasize that the international office as well as their academic advisors are eager to support them and to find adequate study programmes and courses.

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

Criterion 2.2 Workload and credits

Evidence:

- Self-assessment report
- Study plan per program
- Module descriptions per program
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
Based on the National Standards for Higher Education of Indonesia (SNPT), all programmes under review use a credit point system called SKS. According to the legal requirements, a graduate program has to include at least 36 SKS. Both master's programmes meet this requirement. The MoEP consists of 74 credits and the MoMatE of 73 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 and internships, 1 SKS equals 170 minutes of the respective activity per semester week. Regarding the conversion from SKS to ECTS, ITS explains that 1 SKS equals 45.3

hours and thus 1.6 ECTS, based on 28.3 hours per ECTS. The peers acknowledge that a credit point system based on the students' workload is in place.

As explained in 2.1, ITS has added a new category to their curricula that takes into account the extra workload in each course. In this way, ITS ensures that all activities related to the study programmes are credited. Although the peers would recommend assigning these credits directly to the respective modules, they appreciate this procedure since it gives weight to additional activities that would otherwise not be reflected in the workload.

The workload is spread relatively evenly over the semesters. Moreover, the effective number of SKS the students can take depends on their achievements in the previous semester. They can take up to 12 SKS if their GPA is less than 3 and up to 15 SKS otherwise. This mechanism is supposed to ensure that the students can really handle the workload. It also means that students can finish their studies in less than 4 semesters, although this is relatively rare due to the high workload in general.

The peers confirm that the workload in hours is indicated in the module descriptions and the distinction between classroom work and self-studies is made transparent and is in line with the credits awarded. At the end of each semester, the students' workload for every course is monitored and evaluated.

During the discussions with the students, the peers learn that they deem the workload as well as the number of exams to be adequate and that they still find time to develop their individual interests and skills outside of the university by working or taking extracurricular classes.

The peers believe the overall workload to be manageable, especially since nearly all students graduate on time.

Criterion 2.3 Teaching methodology

Evidence:

- Self-assessment report
- Module descriptions per program
- Discussions during the online audit

Preliminary assessment and analysis of the peers:

As ITS explains in the self-assessment report, various student-centered learning methods are utilized in the degree programmes under review. Through the Indonesian regulations on credit points (see chapter 2.2), an adequate balance between face-to-face activities and

independent learning is already ensured for all courses. Besides the regular lectures, methods such as group discussions, project- and problem-based learning, role-plays, simulations etc. are used. The students confirm that these methods are actually in use and that they are highly satisfied with the variety of teaching methods, which support them in achieving the learning outcomes. The classes are sufficiently small to allow the effective use of interactive methods.

During the classes, active and interactive teaching methods (e.g. lectures, discussions, reports, presentations, and group work) are applied. ITS wants to encourage the students to gain knowledge from different scientific areas and to introduce them to research activities. Teaching and learning is supported by a broad range of media, both traditional (books, papers) and online (videos, presentations etc.). The university's online learning management system (MyITS classroom) supports teachers and students in communicating and disseminating learning material. In the course of the Covid-19 pandemic, the university has swiftly switched to online learning with videoconferences, recorded videos and other media.

The peers consider the teaching methodology employed in the degree programmes to be diverse, interactive and to show a healthy mixture between traditional and modern/alternative methods. They are well adapted to the aims and conditions of the individual courses and suitable to support the students in achieving the intended learning outcomes.

Criterion 2.4 Support and assistance

Evidence:

- Self-assessment report
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
In order to support students in completing their studies on 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. Each student meets his or her academic advisor on a regular basis (at least twice per semester), who is also responsible for monitoring the study progress. The academic advisor also has to approve the student's study plan for the semester. As the peers learn and highly appreciate, the study progress is not only monitored by the academic advisor on an individual basis, but the faculty is automatically alerted when students fall below a certain number of

credit points per semester and are thus threatened with dropping out. In these cases, additional advice can be provided.

Furthermore, there is supporting staff in the international office (cf. chapter 2.1), the career centre, the scholarship sector and the general academic administration. The career centre regularly organizes job fairs, seminars with potential employers, trainings for writing applications etc. in order to support the students in their career planning. Moreover, there are many scholarships offered to students, (e.g. from private companies, the government or other foundations). This includes scholarship for students from low-income families and for those with high academic achievements. New students can attend classes to develop their effective learning and soft skills.

In addition, every student who enrols for the thesis or final project course will be assigned one or two thesis supervisors. The role of the thesis supervisors is to help students to complete their thesis research; they also monitor the progress of the thesis in order to ensure the completion of the thesis in the intended amount of time. The students confirm towards the peers that they are supervised in the research group during their work on the thesis. There are regular meetings where the students present their results and receive feedback from the other members.

All students at ITS have access to the online-learning site (MyITS classroom). By using MyITS classroom, lecturers can upload their syllabus and learning materials or modules as well as assignment for students. Through MyITS classroom, students can also interact with other students and lecturers. Students appreciate the MyITS classroom website provided by ITS. The MyITS website plays an important role in accessing academic assessment and some other facilities. ITS facilities such as MATLAB programs, Python database libraries and other applications can be easily accessed through the myITS website.

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 and to complete their studies successfully and without delay.

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

3. Exams: System, concept and organization

Criterion 3 Exams: System, concept and organization

Evidence:

- Self-assessment report
- Module descriptions per program
- ITS academic regulations
- Sample written exams and final theses

Preliminary assessment and analysis of the peers:
For the examination of the students' achievement, each course determines course objectives to support the achievement of the program learning outcomes of the respective program. Accordingly, each course must assess whether all defined learning outcomes stated in the module description have been achieved. For this purpose, ITS utilizes various types of examination.

In each course, at least two assignments/quizzes, a mid-term and a final examination are employed. There are different assessment methods in the programmes, such as written tests, quizzes, assignments, reports, presentations, and oral examinations. In most courses, mid-term and final exam consist of written tests and additional quizzes or assignments are used. However, the other assessment methods are also used to a certain degree.

The final course grade is calculated based on the score of these individual assessments, whereby the lecturer determines the ratio between them in accordance with the Academic Guidelines. At the first meeting of a course, the students are informed about what exactly is required to pass the module and about how the final grade is determined through the teaching and learning plan. ITS uses a grading system with the grades A, AB, B, BC, C, D and E, where a C (equivalent to a Grade Point of 2) is necessary to pass a module.

The mid-term exams are carried out in the 8^{th} and the final exams in the 16^{th} week of the semester, whereas the smaller quizzes and assignments take place in the other weeks. The students confirm that they are normally well distributed, so that there are no more than a few in any given week.

The students confirm that a variety of assessment methods is used, including traditional methods such as written or oral exams, but also presentations or project reports are utilized. Next to the mid-term and the final exams, students also have some quizzes and projects throughout the semester that all count towards the final module grade. Although this means that the total number of tests taken during a semester is comparatively high, the students do not complain at all about this workload and instead confirm that taking several exams for one course allows for a continuous learning process.

According to ITS regulations, students who cannot participate in the regular exams due to illness or other legitimate reasons have the right to be offered a follow-up exam in the same semester.

The peers were provided with a selection of exams and final projects to check. They confirm that these represent an adequate level of knowledge as required by EQF level 7. The forms of exams are oriented toward the envisaged learning outcomes of the respective courses, and the workload is distributed in an acceptable way.

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

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-assessment report
- Staff handbook per program
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
At ITS, the staff members have different academic positions. There are 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, there are lecturers who hold a Master's degree and lecturers who hold a PhD degree. A full professor needs to hold a PhD degree. The main difference of tasks and responsibilities based on academic staff position lies on the proportion of teaching and research activities. The higher the academic staff position is, the greater is the proportion of research activities, but the lower is the proportion of teaching activities. The latter may become professors once they have earned a certain amount of credits with regard to their academic work.

The minimum qualification for teaching in a master's programme at ITS is a doctoral degree. 24 staff members (18 with a PhD, 3 full professors, 1 emeritus professor and 2 administrative staff members) run the Master 's degree programme of Engineering Physics and 12 (11 lecturers and 1 administrative staff member) run the Master's degree programme of Materials and Metallurgical Engineering. The lecturer-student ratio is 1:3 for the MoEP programme and 1:1.27 for the MoMatE programme.

The academic staff is actively involved in research projects funded by grants from the Indonesian government, the university itself or other research funds, which results in a reasonable number of publications per year. ITS positions itself as a university with a strong research focus, which the peers appreciate. They also learn that students can be involved in research project, for instance through their theses or as part of the master by research path in the MoMatE programme.

The peers highlight the very well qualified and engaged staff members and confirm that the composition and scientific orientation of the teaching staff are suitable for successfully implementing and sustaining the degree programmes. The auditors are impressed by the excellent and open-minded atmosphere among the students and the staff members. Both confirm that in case of questions or problems, there is always an academic advisor available to solve the issues together with the student.

Criterion 4.2 Staff development

Evidence:

- Self-assessment report
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
According to the self-assessment report and the discussions during the online audit, ITS encourages the continuing professional development of its staff. For this purpose, various opportunities are provided. There is a mandatory didactic training for new academic staff that encompasses curriculum design, teaching material, and innovative teaching and learning methods. Moreover, workshops are held to refresh and to deepen various didactic competences in each semester. The lecturers can also regularly participate in external didactical trainings offered and funded by the government.

The teaching staff is encouraged to study abroad or to participate in international research projects and conferences in order to enhance their knowledge, increase their English proficiency and to build international networks. For this purpose, the university informs about possible scholarships to support academic mobility. Particularly for junior lecturers with a master's degree, ITS offers systematic training to prepare them for acquiring a PhD abroad, for instance through English courses, information on foreign education systems, administrative support, and supporting (international) research collaborations.

The peers learn from the teaching staff that there are many different options to apply for funding for research projects, not only from ITS but also from the government and big com-

panies the university collaborates with. The lecturers further highlight the fact that the university provides very good incentives for all teaching staff members. For example, an annual prize is awarded for the largest number of articles published in international journals and successfully raised project funds. However, the lecturers also report that this incentive based system can sometimes also put pressure on their performance and be very demanding.

In summary, the peers appreciate the university's efforts in the further development of its employees 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
- Video material
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
The university and the faculty are mainly funded by the Indonesian government and the community, 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 funding of the degree programmes is secured. The academic staff emphasize that from their point of view, both programmes under review receive sufficient funding for teaching and learning activities as well as research, which results in well-equipped facilities and very good access to current literature, databases and modern software. The students confirm this positive impression and state their satisfaction with the available resources.

In the self-assessment report, ITS gives an extensive overview of the available learning spaces and libraries (university library and department library). Moreover, they list detailed information of all laboratories available per study program. Due to the ongoing COVID-19 pandemic, it is not possible for the peer panel to travel to Indonesia and visit ITS in person. Therefore, the university has provided the peers with professional videos and a live tour showing its campus with some central facilities, relevant research and teaching facilities and, in particular, all the different laboratories available for both study programmes. The peers are impressed by the range of learning tools and resources available to the students. They consider the university's facilities and available equipment in the labs to be of highest standards and are convinced that the laboratories adhere to the international safety standards. The relatively newly constructed premises are spacious and offer ample opportunities for the professional and individual development of students and teachers. The students

confirm that they are provided with all relevant software and are given easy access to all necessary rooms and equipment.

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

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

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module descriptions per program

Preliminary assessment and analysis of the peers:
The module descriptions for both programmes are published on the university's website in Bahasa Indonesia and English, so that students and stakeholders can access them at any time.

After studying the module descriptions, the peers confirm that they include all necessary information about the persons responsible for each module, the teaching methods and workload, the credit points awarded, the intended learning outcomes, the applicability, the admission and examination requirements, and the forms of assessment as well as details explaining how the final grade is calculated.

However, the peers note that a number of literature references in both programmes are not up-to-date. The peers learn from the programme coordinators that all study programmes continuously encourage their students to also study independently by looking for current literature in the library. Moreover, they explain that the teaching staff regularly shares current literature references with their students. The peers understand that the literature actually used in the study programmes goes beyond the literature listed in the module descriptions. Consequently, the peers recommend providing an adequate and updated list of relevant literature references in the module descriptions of both study programmes.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Sample diploma per program
- Sample transcript of records per program
- Sample diploma supplement per program

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

Criterion 5.3 Relevant rules

Evidence:

- All relevant rules on the studies, examination, admission and quality assurance were provided and are published on the university's website
- Self-assessment report
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
The peers confirm that the rights and duties of both ITS and the students are clearly defined and binding. All rules and regulations are published on the university's website in Bahasa Indonesia as well as in English and hence available to all stakeholders. In addition, the students receive all relevant course material in the language of the degree program at the beginning of each semester.

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

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- ITS guidebook on internal quality assurance
- Discussions during the online audit

Preliminary assessment and analysis of the peers:
The peers learn that there is an institutional system of quality management aiming at continuously improving the degree programmes. This system relies on internal (SPMI) as well as external (SPME) quality assurance.

SPME focuses on both national and international accreditations. Every degree program and every Higher Education Institution in Indonesia has to be accredited by the national Accreditation Agency (BAN-PT). ITS as an institution as well as the MoEP program have received the highest accreditation status (A) from BAN-PT, and the MoMatE programme received Grade B.

SMPI encompasses all activities focused on implementing measures for improving the teaching and learning quality at the university. ITS has a Quality Assurance Office (KPM), which conducts regular scans of academic and non-academic quality criteria within the institution. Apart from this office, there are different quality assurance units in place, such as the Faculty Quality Team (TMF), Department Quality Team (TMD), and Degree program Quality Team (TMP). Different measures are taken to gather information about a variety of qualitative aspects of the institution.

Since ITS is striving to become an internationally acknowledged university, the reliance on students' feedback and the necessity to ensure and improve the employability of the graduates are of major importance to the coordinators. Internal evaluation of the quality of the degree programmes is mainly provided through student, alumni and employer surveys.

On the institutional level, ITS annually carries out an SPMI evaluation of ten standards concerning management, resources, strategic development and quality assurance procedures. The performance of the departments is continuously checked through an information system called SIPMONEV. As has already been mentioned, there is a major curriculum revision process for each program every four years and a minor one every year (cf. chapter 1). The graduates are followed by ITS through a regular tracer study conducted by the career center. Internal and external stakeholders give input through these processes in various ways.

Lastly, at the end of each semester, the students give their feedback on the courses by filling out the questionnaire online. The questionnaires are developed by the course survey committee and include questions with respect to the courses in general and about the teachers' performance. The discussion with the students revealed that those in charge are

always eager and open for feedback aside from the official evaluations and that students have the impression that their comments are taken into consideration with regard to the further improvement of the programmes. This becomes apparent in the already mentioned constant curricular revision process that is performed under participation of students and industry partners. The industry representatives confirm in the discussion that the university is eager to receive feedback about new developments and trends and the employability of their graduates. The peers particularly appreciate that ITS implemented an advisory board consisting of government, alumni, different associations and other stakeholders who are involved in modifying and improving the curricula of the degree programmes.

Concerning the internal feedback loops, the results of the course evaluations are centrally assessed and analysed before they are communicated to the Head of Department who would then be responsible to initiate any measures if problems or needs for improvement have been detected. A summary of the results is made accessible to the students. In case the satisfaction of the students with staff members is deficient, the Heads of Department will contact the respective teacher, discuss the issue and propose solutions. If no improvement can be achieved over a longer period, the staff member will be dismissed. Thus, the peers agree that the quality management circles at ITS are well established and work under participation of all stakeholders.

In summary, the peers are satisfied with the quality management system at ITS, especially with the continuous feedback loops and the involvement of important stakeholder groups such as students, alumni and representatives from the industry.

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

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution

The university agreed to not submit a statement.

F Summary: Peer recommendations (17.11.2022)

Taking into account the additional information and the comments given by ITS, 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
Ma Engineering Physics	Without requirements	30.09.2028	--	--
Ma Materials and Metallurgical Engineering	Without requirements	30.09.2028	--	--

Recommendations

E 1. (ASIIN 5.1) It is recommended to update the literature references in the module descriptions

E 2. (ASIIN 1.1) It is recommended to better incorporate the knowledge of new developments in the different scientific areas (e.g. Data Analytics, Programming, Industry 4.0, Internet of Things) in the curricula.

E 3. (ASIIN 1.1) It is recommended to guide students on lifelong learning and concepts of how to learn.

E 4. (ASIIN 1.3) It is recommended to offer more opportunities for students to improve their English language proficiency.

For the Engineering Physics programme

E 5. (ASIIN 1.3) It is recommended to extend the internship to a minimum of three months.

For the Materials and Metallurgical Engineering Programme

E 6. (ASIIN 2.1) It is recommended to increase practical experiences of the students, e.g. by introducing an internship.

G Comment of the Technical Committee (22.11.2022)

Technical Committee 05– Materials Science, Physical Technologies

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the accrediting procedure and follows the assessment of the peers with some minor edits to make the recommendations more precise.

The Technical Committee 05 – Materials Science, Physical Technologies recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Engineering Physics	Without requirements	30.09.2028	--
Ma Materials and Metallurgical Engineering	Without requirements	30.09.2028	--

Recommendations

E 1. (ASIIN 5.1) It is recommended to update the literature references in the module descriptions

E 2. (ASIIN 1.1) It is recommended to better incorporate the knowledge of new developments in the different scientific areas (e.g. Data Analytics, Programming, Industry 4.0, Internet of Things) in the curricula.

E 3. (ASIIN 1.1) It is recommended to guide students on lifelong learning and concepts of how to learn.

E 4. (ASIIN 1.3) It is recommended to offer more opportunities for students to improve their English language proficiency (e.g. advice in scientific writing).

For the Engineering Physics programme

E 5. (ASIIN 1.3) It is recommended to officially extend the internship to a minimum of three months.

For the Materials and Metallurgical Engineering Programme

E 6. (ASIIN 2.1) It is recommended to increase practical experiences of the students, e.g. by introducing an internship with a minimum duration of three months.

H Decision of the Accreditation Commission (09.12.2022)

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

The Accreditation Commission discusses the procedure and agrees with the changes suggested by the Technical Committee.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label
Ma Engineering Physics	Without requirements	30.09.2028	--
Ma Materials and Metallurgical Engineering	Without requirements	30.09.2028	--

Recommendations

E 1. (ASIIN 5.1) It is recommended to update the literature references in the module descriptions

E 2. (ASIIN 1.1) It is recommended to better incorporate the knowledge of new developments in the different scientific areas (e.g. Data Analytics, Programming, Industry 4.0, Internet of Things) in the curricula.

E 3. (ASIIN 1.1) It is recommended to guide students on lifelong learning and concepts of how to learn.

E 4. (ASIIN 1.3) It is recommended to offer more opportunities for students to improve their English language proficiency (e.g. advice in scientific writing).

For the Engineering Physics programme

E 5. (ASIIN 1.3) It is recommended to officially extend the internship to a minimum of three months.

For the Materials and Metallurgical Engineering Programme

E 6. (ASIIN 2.1) It is recommended to increase practical experiences of the students, e.g. by introducing an internship with a minimum duration of three months.

Appendix: Programme Learning Outcomes and Curricula

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

The Program Learning Outcomes of master program of Engineering Physiscs

Code	PLOs
PLO 1	Graduates possess in depth comprehension of advanced mathematics, physics, and engineering in order to solve complex problems.
PLO 2	Graduates are able to develop a critical, and creative thinking in identifying, formulating, solving, and evaluating the scientific and engineering problems that emerge in the field of engineering physics on an intra- or multidisciplinary basis.
PLO 3	Graduates are able to identify and to develop the appropriate methodologies as well as to analyze and to evaluate research and engineering data.
PLO 4	Graduates are able to work in an interdisciplinary and multicultural team within their professional ethics.
PLO 5	Graduates are able to effectively communicate in both oral and written format
Industrial Instrumentation Engineering	
PLO 6.I	Graduates are able to independently develop innovative methods, skills and tools required in designing and optimizing an instrumentation and control system in industry under certain operational limitations
Renewable Energy Engineering	
PLO 6.E	Graduates are able to independently develop innovative methods, skills and tools required in designing and optimizing renewable and sustainable energy system under various parameter condition

The following **curriculum** is presented:

MATA KULIAH PROGRAM MAGISTER TEKNIK FISIKA
THE SUBJECT IN MASTER PROGRAM OF ENGINEERING PHYSICS

Code	Subject	Semester	Credit	ECTS
TF185101	Fisika Teknik Lanjut Advanced Engineering Physics	1	3	4.8
TF185102	Matematika Teknik Lanjut Advanced Engineering Mathematics	1	3	4.8
TF185271	Metodologi Penelitian Dan Proposal Tesis Research Methodology and Thesis`s Proposal	2	3	4.8
TF185371	Internship Internship	3	2	3.2
TF185471	Tesis Thesis	4	5	8
Total credit/ECTS in general course			**16**	**25.6**

Industrial Instrumentation Engineering (IIE)				
Code	**Subject**	**Semester**	**Credit**	**ECTS**
TF185104	Dinamika Sistem Lanjut Advance System Dynamics	1	2	3.2
TF185103	Instrumentasi Lanjut Advanced Instrumentation	1	2	3.2
TF185201	Kontrol Otomatik Lanjut Advanced Automatic Control	2	2	3.2
TF185202	Sistem Optimisasi Optimization System	2	2	3.2
TF185203	Pemrosesan Sinyal Signal Processing	2	2	3.2
TF185301	Rekayasa Desain Engineering Design	3	2	3.2
TF1853xx	MK Pilihan 1/Elective course 1	3	2	3.2
TF1883xx	MK Pilihan 2/ Elective course 2	4	2	3.2
TF1853xx	MK Pilihan 3/Elective course 3	4	2	3.2
TF1854xx	MK Pilihan 4/ Elective course 4	4	2	3.2
Total credit/ECTS in IEE main courses			**20**	**32**

Renewable Energy Technology (RET)				
Code	**Subject**	**Semester**	**Credit**	**ECTS**
TF185140	Pemetaan Potensi Energi Mapping of Energy Potency	1	2	3.2
TF185130	Statistik Energi Energy Statistics	1	3	4.8
TF185220	Optimisasi Sistem Energi Optimization of Energy System	2	2	3.2
TF185230	Sistem Energi Terbarukan Renewable Energy System	2	2	3.2
TF185210	Teknologi Konversi Energi Energy Conversion Technologies	2	2	3.2
TF185310	Audit dan Manajemen Energi Audit and Energy Management	3	2	3.2
TF1853xx	MK Pilihan 1/Elective course 1	3	2	3.2
TF1883xx	MK Pilihan 2/ Elective course 2	4	2	3.2
TF1853xx	MK Pilihan 3/Elective course 3	4	2	3.2
TF1854xx	MK Pilihan 4/ Elective course 4	4	2	3.2
Total credit/ECTS in RET main courses			**21**	**33.6**

KEGIATAN TAMBAHAN MATA PELAJARAN
THE ADDITIONAL ACTIVITES OF MoEP SUBJECT

Additional Activities	Credits	ECTS
Industrial Instrumentation Engineering (IIE)		
Review paper, presentation	14	22.4
Report writing	3	4.8
Case study simulation/analysis	2	3.2
Project design	9	14.4
Proposal thesis seminar	2	3.2
Thesis progress report and seminar	2	3.2
Manuscript draft for international conference or indexed national journal	1	1.6
Thesis defense	1	1.6
TOEFL test	2	3.2
Total credit/ECTS in IIE additional activities	**36**	**57.6**
Renewable Energy Technology (RET)		
Review paper, presentation	14	22.4
Report writing	3	4.8
Case study simulation/analysis	10	16
Project based learning	2	3.2
Proposal thesis seminar	2	3.2
Thesis progress report and seminar	2	3.2
Manuscript draft for international conference or indexed national journal	1	1.6
Thesis defense	1	1.6
TOEFL test	2	3.2
Total credit/ECTS in RET additional activities	**37**	**59.2**

According to the Website the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Masters's degree programme Materials and Metallurgical Engineering:

PROGRAM LEARNING OUTCOMES (PLO)

NO	PROGRAM LEARNING OUTCOMES (PLO)
PLO-1	The ability to solve materials engineering and metallurgical problems using in-depth knowledge and comprehension of science, technology, and mathematics
PLO-2	The ability to design complex and integrated components, systems and processes related to materials and metallurgical engineering applications
PLO-3	The ability to conduct complex research and investigation systematically in the field of materials and metallurgical engineering by exploring available research literature and resources
PLO-4	The ability to inquire current state of the art of materials and metallurgical engineering and technology, including their advanced applications
PLO-5	The ability to formulate decision with strong basis data and in-depth analysis of information and critically evaluate the decision impact and risk
PLO-6	The ability to work in team whose interdisciplinary and different cultural backgrounds

For by research program, students should also have to pass 36 Credits. In general, loads for graduate students taking by research program are as follows, in which emphasizing on research becomes a distinct remark for graduate study program by research.

- Recognition of Past Learning (RPL) : 3 Credits
- Research Methodology Course : 9 Credits
- Publication/Conference/Patent : 14 Credits
- Thesis : 10 Credits

Please refer to the following ITS Rector Decree about postgraduate program by research

The following **curriculum** is presented:

MODULE HANDBOOK
Master of Materials and Metallurgical Engineering (MoMatE)
Curriculum 2018-2023

Semester 1		
Code	**Course**	**Credit**
	Elective Course	
TL185102	Advanced Materials Characterization	3
TL185104	Design of Corrosion Control System	3
TL185101	Structure and Mechanical Properties of Materials	3
TL185103	Thermodynamics and Kinetics of Materials	3

Semester 2		
Code	**Course**	**Credit**
	Elective Course	
TL185205	Metallurgy of Casting and Welding	3
TL185206	Modelling of Materials Processing	3
TL185207	Heat Treatment and Surface Engineering	3

Semester 3		
Code	**Course**	**Credit**
TL185308	*Thesis Proposal*	3

Semester 4		
Code	**Course**	**Credit**
TL185413	*Thesis*	6

CODE	ELECTIVE COURSE	CREDIT	SEMESTER
TL.185408	Electronic Materials	3	ODD
TL.185405	Mechanics of Composite Materials	3	ODD
TL.185404	Nano Materials Technology	3	ODD
TL.185102	Extractive Metallurgy	3	ODD
TL185409	Bio Materials	3	EVEN
TL185410	Advanced Materials	3	EVEN
TL185411	Advanced Polymers and Ceramic Materials	3	EVEN
TL185407	Energy Conversion and Storage Materials	3	ODD OR EVEN
TL185406	Advanced Ceramic Materials	3	ODD OR EVEN
TL185402	High Temperature Corrosion	3	ODD OR EVEN