ASIIN Seal & EUR-ACE® Label

Accreditation Report

Bachelor's Degree Programmes
Energy Technology
Energy Technology (DD)

Master's Degree Programmes
Energy Conversion
Bioenergy Systems
Nuclear Engineering

Provided by
Lappeenranta – Lahti University of Technology

Version: 24.09.2024

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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]
Energiatekniikan kandidaatin tutkintoohjelma	Bachelor's degree programme in Energy Technology	ASIIN, EUR-ACE® Label,	ASIIN, 30.6.2017-30.9.2024	TC01, TC02, TC05
Bachelor's degree programme in Energy Technology, DD	Bachelor's degree programme in Energy Technology, DD	ASIIN, EUR-ACE® Label,	/	TC01, TC02, TC05
Master's degree programme in Energy Conversion	Master's degree programme in Energy Conversion	ASIIN, EUR-ACE® Label,	ASIIN, 30.6.2017-30.9.2024	TC01, TC02, TC05
Master's degree programme in Bioenergy Systems	Master's degree programme in Bioenergy Systems	ASIIN, EUR-ACE® Label,	ASIIN, 30.6.2017-30.9.2022 (prolongation until 30.9.2023)	TC01, TC02, TC05
Master's degree programme in Nuclear Engineering	Master's degree programme in Nuclear Engineering	ASIIN, EUR-ACE® Label,	ASIIN, 30.6.2017-30.9.2022 (prolongnation until 30.9.2023)	TC01, TC02, TC05
Date of the contract: 16.02.2022 **Submission of the final version of the self-assessment report:** 20.02.2023				

[1] ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes

[2] TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology; TC 05 - Materials Science, Physical Technologies.

Date of the onsite visit: 19.-20-04.2023 **at: Lappeenranta Campus**	
Peer panel: Prof. Dr. Frank Gronwald, University of Siegen; Prof. Dr.-Ing. Olaf Wünsch, University of Kassel Prof. Dr. rer. nat. Andreas Schleicher, University of Applied Sciences Jena Dr. rer. nat. Alfred Schulte, Robert Bosch GmbH Tanja Pelkonen, University of Vaasa (Student)	
Representative of the ASIIN headquarter: Paulina Petracenko	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 07, 2021 Subject-Specific Criteria Technical Committee 02 – Electrical Engineering/Information Technology as of September 23, 2022 Subject-Specific Criteria of Technical Committee 01 – Mechanical Engineering/Process Engineering as of March 16, 2021 Subject-Specific Criteria of Technical Committee 05 – Materials Science, Physical Technologies as of September 29, 2016	

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's degree programme in Energy Technology	Bachelor of Science (Technology)		6	Full time	/	6 Semester	180 ECTS	2008
Bachelor's degree programme in Energy Technology, DD	Bachelor of Science (Technology)		6	Full time	Hebei University of Technology (HEBUT)	6 Semester	180 ECTS	1.9.2021
Master's degree programme in Energy Conversion	Master's degree programme in Energy Conversion		7	Full time	/	4 Semester	120 ECTS	1.9.2019
Master's degree programme in Bioenergy Systems	Master of Science		7	Full time	/	4 Semester	120 ECTS	1.9.2019
Master's degree programme in Nuclear Engineering	Master of Science (Technology)		7	Full time	/	4 Semester	120 ECTS	1.9.2019

For the Bachelor's degree programme Energy Technology the institution has presented the following profile in the self-assessment report:

"The three-year BSc programme in Energy Technology (taught in Finish) provides students with basic knowledge in general engineering skills, i.e. mathematics, physics, and computer science as well as in closely related engineering disciplines: mechanical engineering, electrical engineering, and sustainability. This is done during the first year and half of the studies. The subject specific studies include the most relevant energy technology-related topics, such as thermodynamics, heat transfer, fluid mechanics, nuclear engineering, power plant engineering to name a few. Additionally, transferable skills are being taught within the engineering courses, and the programme also includes language and communication studies.

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

The students must complete their studies with a minor which is recommended to be electrical engineering, energy economics, industrial engineering or sustainability science. However, the students can also choose any BSc level minor offered by the university."

For the Bachelor's degree programme Energy Technology (DD) the institution has presented the following profile on their website:

„The Bachelor's Programme in Energy Technology (DD) is an international double degree programme developed in cooperation with Hebei University of Technology (HEBUT) in China. It was commenced in 2021 and is targeted mainly to international students and students from the partner university HEBUT. Students admitted to this bachelor's programme will receive a degree certificate from two universities after they have fulfilled the degree requirements of both universities. Students complete the entire degree in Lahti, Finland.

The programme focuses on the most efficient, environmentally friendly production and distribution of a basic element in our daily well-being: energy and its related technologies.

The main themes of the studies are the efficient production and use of energy and environmental friendliness. The training will be based on three key areas of expertise in energy technology: physical phenomena related to energy technology, such as policies that affect the shape and magnitude of energy; energy conversion from one form to another; and machinery and equipment for energy conversion.

At LUT University, energy technology research and training are based on expertise in power plant technology and energy management. LUT also offers unique nuclear engineering training with a focus on nuclear safety. The emphases of the degree programme have been selected on the basis of the skills required in the working world."

For the Master's degree programme Energy conversion the institution has presented the following profile on their website

„The Master's programme in Energy Conversion gives students a comprehensive understanding of how different energy production and conversion methods relate to each other and act as components in energy systems.

It is a two-year programme and leads to the degree of Master of Science in Technology, M.Sc. (Tech.), which is 120 ECTS credits. The programme includes core, advanced specialisation, minor and elective studies as well as a Master's thesis.

In this programme, students will understand the technical, environmental and economic aspects of energy conversion and how they compare in producing sustainable and feasible energy for society.

After completing this Master's programme, students will possess:

- professional skills to work as a specialist in energy technology;
- competence to analyse, design and select energy conversion processes for different applications, taking technological, economic, environmental and societal aspects into account;
- knowledge of how to apply and develop mathematical models to solve energy technology problems and design energy technology related equipment, plants, processes and systems;
- managerial skills to manage and organise both national and international projects.

Graduates of the programme work in many fields, typically in research and development, in energy production companies or equipment manufacturers, in sales, as managers, consultants, civil servants etc."

For the Master's degree programme Bioenergy Systems the institution has presented the following profile on their website:

"The MSc programme in Bioenergy Systems focuses on giving the students good understanding of different aspects of utilising bioenergy as a part of modern energy systems. The different technological, environmental, economic and societal aspects of bioenergy are covered during the studies. The studies include also courses on conversion technologies such as fluid machinery and steam boilers and turbines, as well as mathematics. Additionally, the students complete their studies with minor studies and elective advanced specialisation studies where students choose elective courses from a pre-defined list. The programme gives students capabilities to work in different roles in different types of organisations. Transferrable skills are included in the subject courses."

For the Master's degree programme Nuclear Energy the institution has presented the following profile on their website:

"At LUT, nuclear engineering research and education focus on three aspects: nuclear power plant engineering, nuclear safety, and reactors for new applications – including next generation technologies.

This Master's programme will give students a comprehensive understanding of how to utilise nuclear power safely. Students will learn how to design nuclear reactors. Nuclear power plant engineering focuses on how different components in nuclear power plants work together, what specific requirements apply to components used in nuclear power plants, how to design for radiation protection, and how to consider the life cycle of power plants, including fuel and waste management.

Nuclear safety focuses on preventing accidents and on how a plant is operated safely if accidents happen. Research on next generation reactors focuses on small modular reactors.

The studies will emphasise light water reactors, but students will also learn the basic principles of other reactor types, including fast reactors and heavy water and gas cooled reactors.”

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
- Diploma Supplements
- Websites of all study programmes
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The experts base their assessment of the learning outcomes on the information provided on the websites, the Diploma Supplements and in the Self-Assessment Report of all five degree programmes under review.

The peers refer to the Subject-Specific Criteria (SSC) of the Technical Committees Mechanical Engineering/Process Engineering, Electrical Engineering, and Materials Science/Physical Technology as a basis for judging whether the intended learning outcomes of the five programmes correspond with the competences as outlined by the SSC. As a result, they come to the following conclusions:

In general, the intended learning outcomes of all degree programmes under review are aligned with the mission and strategy of Lappeenranta – Lahti University of Technology (LUT), which focuses on discovering scientific solutions on global sustainability challenges such as transition to carbon-neutral world, the sustainable use of different raw materials, water, and energy resources as well as development of a circular economy.

[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.

Graduates of the two Bachelor's programmes Energy Technology and Energy Technology (DD) should be able to

- "Describe the physical basic phenomena related to energy technology
- Apply basic equations of thermal engineering in the examination of energy conversion related processes
- Describe the structure and operation principle of the equipment related to energy technology (boilers, turbines, compressors, fans, heat exchangers)
- Calculate operating values of equipment, define their design values, and understand their design principles.
- Describe the operation and design principles of various energy conversion processes
- Compare the applicability of various energy conversion processes to different applications from technological, economic and environmental perspectives
- Acquire information from various sources and evaluate their quality and reliability
- Communicate both orally and in writing in national and international context."

Graduates of the two Master's programme in Energy Conversion should be able to

- "Analyse, design and select energy conversion processes for different applications, taking technological, economical, environmental and societal aspects into account.
- Apply and develop mathematical models to solve energy technological problems.
- Manage and organize both national and international projects.
- Design energy technology related equipment, plants, processes and systems.
- Communicate and act in academic and research environments.
- Work as specialist in energy technology."

Graduates of the two Master's programme in Bioenergy Systems should be able to

- "Analyse, design and select energy conversion processes for different applications, taking technological, economical, environmental and societal aspects into account.
- Apply and develop mathematical models to solve energy technological problems.
- Investigate and design small-scale bio-energy systems.
- Understand what prerequisites various bio-fuels sets for their utilization (processes and equipment).
- Take part in strategic planning at a national level to increase the use of bio-energy nationally.

- Understand and explain the benefits and drawbacks of different bio-energy generation technologies.
- Manage and organize both national and international projects.
- Design energy technology related equipment, plants, processes and systems.
- Communicate and act in academic and research environments.
- Work as specialist in energy technology."

Graduates of the Master's programme in Nuclear Engineering should be able to

- "Utilise different numerical methods of reactor physics and thermal hydraulic safety analysis.
- Understand the nuclear fuel cycle.
- Understand and explain the design principles of nuclear reactors, nuclear steam supply systems and safety systems.
- Understand protection against ionizing radiation.
- Apply and develop mathematical models to solve energy technological problems.
- Manage and organize both national and international projects.
- Design energy technology related equipment, plants, processes and systems.
- Communicate and act in academic and research environments.
- Work as specialist in energy technology."

In order to verify that the degree programmes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG) for engineering programmes, the experts analyse the submitted study plan, intended learning outcomes, and module descriptions. The EUR-ACE® Framework Standards and Guidelines requires that engineering programmes cover the following seven competence areas: Knowledge and Understanding, Engineering Analysis, Engineering Design, Investigations, Engineering Practice, Making Judgements Communication and Team-working, and Lifelong Learning. The documents illustrate that the degree programmes under review cover all the required competence areas and the peers perceive during the audit discussions with teachers and students that the mentioned competences are conveyed in the respective courses.

From the discussion with the employers, who are very satisfied with the qualification profile of the graduates, the experts gain the impression that they are well prepared for entering the labour market and can find adequate jobs in Finland and abroad. In general, all graduates have good and manyfold job perspectives.

The peers are convinced that the intended qualification profiles of all five programmes under review allow graduates to take up an occupation, which corresponds to their qualification. The degree programmes are designed in such a way that they meet the goals set for them. The objectives and intended learning outcomes are concise, well founded, and transparently anchored and published.

In order to verify that the intended learning outcomes of the five degree programmes are covered by the respective curriculum, LUT has submitted a matrix for each degree programme that shows, in which course which learning outcomes are targeted. The peers can deduce the correlation of the programmes' competence profile with the SSC and see how each course contributes to achieving the intended learning outcomes from the provided Matrix for each programme. Moreover, the peers confirm that the intended learning outcomes of all programmes are aligned with the EUR-ACE® Framework Standards and Guidelines (EAFSG) for engineering programmes.

The peers conclude that the objectives and intended learning outcomes of the degree programmes adequately reflect the intended level of academic qualification (EQF 6 for the bachelor's programme and EQF 7 for the master's programmes). The programmes also correspond sufficiently with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee Mechanical Engineering/Process Engineering, Electrical Engineering, and Materials Science/Physical Technology, and the EUR-ACE® Framework Standards and Guidelines (EAFSG).

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report
- Diploma Supplements

Preliminary assessment and analysis of the peers:
The peers confirm that the English translation and the original Finnish names of the Bachelor's and Master's degree programmes correspond with the intended aims and learning outcomes as well as the content of the respective degree programme

Criterion 1.3 Curriculum

Evidence:

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

- Self-assessment report

Preliminary assessment and analysis of the peers:
The two Bachelor's degree programmes Energy Technology and Energy Technology (DD) are designed for three years, offered as full-time programmes, and encompass 180 ECTS points each. The curriculum consists of

- general studies, at least 50 ECTS credits,
- intermediate specialisation studies, at least 40 ECTS credits,
- minor studies, 0–20 ECTS credits, and
- elective studies 0–10 ECTS credits.

During the first year and half of the studies, the students gain basic knowledge in general engineering skills, i.e. mathematics, physics and computer science as well as in closely related engineering disciplines: mechanical engineering, electrical engineering, and sustainability. The subject specific studies include the most relevant energy technology-related topics, such as thermodynamics, heat transfer, fluid mechanics, nuclear engineering, power plant engineering. In addition, students are taught language and communication skills as part of the intermediate specialisation studies. Students of both Bachelor programmes must chose a minor. In the regular programme, it is recommended that students select electrical engineering, energy economics, industrial engineering or sustainability science. In the Double Degree programme version, Chinese Business, Culture and Technology is also recommended as a minor. In their last semester, all Bachelor students have to complete their Bachelor thesis and the accompanying seminar. In the double degree Bachelor's programme in Energy Technology (DD), teachers from the Hebei University of Technology - partner university co-supervise part of the theses.

Students of the Double Degree programme complete the entire degree at the Lahti campus. Non-Chinese speaking students must pass a language test during their studies at LUT to receive a degree from Hebei University of Technology. The language test assesses the student' abilities in the application of everyday Chinese (Mandarin). The programme coordinators add that modules are imported from HEBUT to LUT, so that teachers from HEBUT teach the modules that are also offered at their home institution at LUT. Upon successful graduation, students of the double degree programme will receive a degree certificate from two universities.

Students of the Bachelor programmes are required to complete an internship of at least four weeks in full-time mode. The internship is credited with 2 ECTS points, which is equivalent to 54 hours of students' work. A four-week full-time internship, however, encom-

passes 160 hours. Consequently, if students work four weeks full time during the compulsory internship, the awarded ECTS points should reflect that workload. In the Master programmes students are not obliged to carry out an internship. Yet, they can take an internship maximum worth of 8 ECTS points as part of the elective studies. In the audit discussions, the experts learn that the form of the internship is similar to a summer job. From the first year onwards, most students work every summer in a company related to their field of study. Four weeks of the practical time are recognised as an official internship. Students explain that working during the summer holidays is a very common practice in Finland, as it allows them to gain practical experience and earn money. However, they emphasise that during these practical periods they do not perform simple manual tasks that could be associated with a summer job, but advanced tasks of an engineer that match their qualification profile. For example, a few students regularly work in a nuclear plant, where they can deepen and apply their knowledge gained during their studies. The industry representatives confirm that the students are well integrated into the companies during the internships and take over engineering tasks from other highly qualified employees. The students are very satisfied with this system as it allows them to gain valuable practical experience that is helpful when looking for a suitable job after graduation and during the transition period at the future workplace. However, the international students of the Double Degree Bachelor programme express that they had difficulties adapting to the internship system in Finland: As they were not familiar with the system in their home country and were not sufficiently informed about it in Finland, many students did not know what to pay attention to when organizing and applying for the internship. For example, some of the students did not know that companies or future employers expect students to start practical experience early. In addition, some companies expect a basic knowledge of the Finnish language, which not all international students have. The experts understand the arguments of the students and recommend that LUT inform international students more clearly and at an early stage of their studies about the internship system in Finland. Also, LUT could offer more support services for international students in finding and applying for internships. Aside from this, the experts appreciate that internships are well integrated into the curricula and that students get a profound insight into the industry at an early stage.

All three Master's degree programmes are designed for two years and offered as a full-time programmes. Students need to achieve 120 ECTS points, in order to complete the respective programme successfully.

The Master programmes consist of

- core studies, 0–47 ECTS credits,

- advanced specialisation studies, 50–95 ECTS credits (including a Master's thesis worth 30 ECTS credits),
- minor studies, at least 20–24/0 ECTS credits,
- elective studies, 0–30 ECTS credits,
- language and communication studies, 0–10 ECTS credits.

In the Master programme Energy Conversion, students are taught different energy conversion techniques, their design and operations, accounting for the technological, economic, environmental and societal aspects. The studies include topics such as power plant engineering, fluid machinery, steam boilers and steam turbines, and modelling of energy systems. Students have the chance to deepen their knowledge in a certain field through the minor and elective studies.

The Master programme Bioenergy Systems focuses on different aspects of utilising bioenergy as a part of modern energy systems. The different technological, environmental, economic and societal aspects of bioenergy are covered during the studies. The studies include also courses on conversion technologies such as fluid machinery and steam boilers and turbines, as well as mathematics. Here too, the students complete their studies with minor studies and elective advanced specialisation studies.

The Master programme in Nuclear Engineering gives the graduates a comprehensive understanding on safe and reliable nuclear power. The studies include topics such as nuclear power plant engineering, maintenance management, courses on nuclear reactors, and thermal hydraulics. Additionally, it includes courses on sustainability, mathematics, transferrable skills and competencies, and minor and elective advanced specialisation studies.

In their final year, all Master students conduct their research activities and write a thesis. The members of the teaching staff explain on demand of the peers that they offer possible topics for the final projects according to their own research projects. Students can also develop their own concepts for their Bachelor or Master thesis and it is possible to conduct the thesis outside LUT.

After reviewing the study plans and module descriptions of all programmes, the experts conclude that the curricula enable students to achieve the intended learning outcomes of the respective programmes. However, considering that sustainability is not only a very important topic in itself, but also a central theme and objective of the LUT, the experts miss the treatment of environmental issues in all the programmes reviewed. The programme coordinators explain that these issues are addressed in a variety of modules in each programme, for example when discussing examples of applications. They also emphasise that the issue of CO_2 emissions and its consequences is addressed in almost all modules, but

that there is no separate module for this topic. The students confirm that environmental issues are not the focus of their studies, but are built into several modules. Since this is not reflected in the module descriptions, the experts require that the module descriptions are revised so that they transparently mirror the actual module content. Furthermore, as matters of the environment and sustainability are nowadays crucial for the study of energy forms, the experts recommend integrating environmental topics more into the curricula of all the study programmes under review. They suggest including designated elective modules, which focus on these aspects.

In addition, students notify the assessors that some topics are often repeated across several modules in the Bachelor's degree programmes. The experts ask whether this could be due to the division of the programme into smaller modules (up to 3 CPs), which leads to a distribution of similar topics over several modules. The students state that they appreciate the structure of the smaller modules, as it makes the exams less stressful and the study more manageable. They suggest keeping the smaller modules but combining the content to avoid repetition of the same content in different modules. The experts agree with the suggestion of the students and recommend synchronizing related course content.

Finally, the experts note that some of the teachers involved in the programmes only have a Master's degree. This is especially true for the subjects of mathematics and physics. To ensure that the teaching in these subjects is of high quality and corresponds to the respective academic level, the experts require that at least the module responsible for these courses must have a doctorate or higher degree. This would ensure that the content of the subjects is regularly monitored and conforms to the respective academic standard.

In summary, 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. They also confirm that all programmes are reviewed annually and changes are made if requested by stakeholders. The experts confirm that the programmes are of high quality in terms of relevance, content and structure, and are aligned with the EUR-ACE® Framework Standards and Guidelines.

International Mobility

LUT provides several opportunities for students to conduct stays abroad and to join exchange programmes abroad. The credits acquired abroad are transferable to LUT.

The Office of International Affairs at LUT is responsible for managing and coordinating the international activities such as coordinating and managing student mobility programmes, developing and maintaining relationships with partner institutions and organisations around the world, recruiting and admitting international students, providing support and

assistance to international students during their time at LUT, such as helping with housing, visa issues, and other practical matters.

In order to ensure the recognition of all achievements made during the mobility, the completion of a Learning Agreement is an obligatory part of the preparation for the exchange study. The Learning Agreement must be signed by the student, the respective study advisor at LUT and the exchange university before the start of the exchange semester. Students can find detailed information on the procedure of a Learning Agreement on the LUT website.

The peers confirm that several opportunities for going abroad exist and that student services offer support and advice for students interested in exchange studies at a foreign university. However, the number of outgoing students is still low. For instance, in the Master programme Energy Conversion 5 students spent a semester abroad since 2020. In the Bachelor programme Energy Technology there were 3 outgoing and 14 incoming students since 2018. In the Master programme Energy Technology, on the other hand, the outgoing and incoming numbers are significantly higher: since 2018, there were 24 outgoing students and 49 incoming students. In the audit discussions, the students state that they consider the mobility opportunities attractive and that they regularly receive information by the International Office on the offers and guidance services. When asked about their experience with the recognition of achievements, they report that they have heard of some cases in which not all of the courses a student had taken abroad were recognized at LUT. They explain that this might be due to compulsory modules at LUT, which are timely fixed, or lab courses, which might not be recognized from the partner university. Since LUT has defined concrete rules for the recognition of achievements, the experts see the potential root of the mentioned difficulties in the missing window for mobility: For none of the programmes under review, LUT has defined window of mobility. The experts therefore recommend appointing a certain semester that is most suitable for a semester or internship abroad. Ideally, the semester should include only elective modules in the regular study plan so that students have more flexibility when choosing courses at the partner university. It also should ensure the recognition of all courses taken abroad. Moreover, the experts advise LUT to pay more attention when organizing the exchange semester on the selection of the courses of the student and its compatibility with courses at LUT; overall, the regulations of recognition must be implemented in their entirety.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report

- Homepage LUT: https://www.lut.fi/en/studies/apply-lut
- Homepage studyinfo.fi: https://opintopolku.fi/konfo/en/
- Universities act 558/2009 (Amendments up to 644/2016 included)
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The admission to LUT is regulated according to the Finnish Universities Acts (558/2009 and 428/2013) and is organised by joint application system called DIA that is used by all Finnish universities. An applicant for a Bachelor's degree programme can apply for six degree programmes in order of preference in one or several universities or universities of applied sciences using the same application form. Condition for an application is the completion of the Finnish matriculation examination, a three-year vocational degree or an equivalent international high school degree. Students can be selected based on their success in the Finnish matriculation examination or by their success in the entrance examinations. The entrance examinations are organised jointly by the seven technical universities in Finland. The entrance examination is based on the Finnish high school curriculum in mathematics, physics and chemistry. Prospective students must pass the entrance examination to be selected even if there are fewer applicants than places available. This guarantees the minimum required knowledge in natural sciences and mathematics of all first year students. The further details are regulated in Sections 36 and 37 of the Finnish Universities Act (558/2009). Admission criteria and other admission information is published in the University's web pages in English and in Finnish. The annual intake of students on average is 70 students in the Bachelor programme Energy Technology and 30 students in the Bachelor programme Energy Technology DD.

The students are encouraged to apply for a Master degree programme as soon as their Bachelor's studies are finished. They are also allowed to take Master level studies even before their graduation, which assures a smooth transition from the Bachelor studies to the Master studies.

The admission procedure for the Master programmes currently operates with two different recruitment channels: 1) internal students continuing their Master's degree after their Bachelor's studies at LUT; 2) external applicants with an appropriate Bachelor's degree.

The annual intake of students is 35 students in the Master programme Energy Conversion, 25 students in the Master programme Bioenergy Systems, and 15 students in the Master programme Nuclear Engineering.

The Master programmes are open for all graduates with a Bachelor degree. The admission in the first stage is based on the GPA of the Bachelor's degree, programme-related studies,

and work experience. In the second stage of the admission process, a limited number of applicants will be invited to an interview. The interview will evaluate the applicant's motivation, relevant work experience, suitability to the programme and possibilities for successfully completing studies of the program as well as language and communication skills in English. In addition, all applicants must provide an English language certificate.

According to the university guideline for the recognition of prior learning and credit transfer, students may apply to have classes completed outside of LUT recognised as a substitute for a course at LUT or as part of the minor or elective studies. The decision is made based on the learning outcomes achieved, contents, equivalences and applicability to the degree. The student must apply for the credit transfer in written form and the application can be accepted entirely or partly, or rejected. If the application is rejected, the grounds for rejection must be stated in the decision. The peers acknowledge that the rules for the recognition of achievements and competences acquired at other higher education institutions are in accordance with the Lisbon Recognition Convention.

In summary, the auditors find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

Criterion 1.5 Workload and Credits

Evidence:

- Self-Assessment Report
- Study plans
- LUT Degree Regulation
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:
Based on the LUT Degree Regulation, all programmes under review use the European Credit Transfer System (ECTS) to measure the students' total workload in each course. In the LUT University Degree Regulations, it is defined that one ECTS point corresponds to 27 hours of students' total workload including attendance time in classes as well as self-studies. Completing a degree requires an annual workload of 1600 hours, which corresponds to 60 ECTS points. All LUT Bachelor's degrees encompass 180 ECTS points and Master's degree 120 ECTS points.

When reviewing the module descriptions, the experts found inconsistencies in the allocation of the workload per ECTS point for several modules. For example, the “Electrical Circuits module” in the Bachelor's degree programme in Energy Technology is credited with 4 ECTS. The stated total workload is 104 hours. This results in a correlation of 26 hours per ECTS point. The module “Engineering Mathematics” 1 is credited with 3 ECTS points for a total workload of 90 hours. This results in a correlation of 30 hours per ECTS point. The experts therefore insist that each module has the same ratio of workload and credit points.

Compulsory courses, including possible minor studies, are prescheduled in the students’ personal study plans (PSP) to help students schedule their studies and to graduate in the targeted time. The PSP outlines which courses are included in the student's degree and how they situate in the degree structure according to the curriculum. Students prepare their PSP at the early stages of their studies and review and update it together with their study counsellors.

Each degree programme has a study advisor and tutors, who are responsible for the guidance of the students in the respective degree programme. The guidance includes peer tutoring from older students for newcomers, orientation days and welcoming information at the beginning of the academic year in September, discussions with study councillors on the degree structure and personal study and career plans, and advice on international exchange. The tutors are involved in helping the new students to cope with the requirements of university studies and to help with the problems caused by the transition from high school to university.

According to statistics provided by LUT, students in the Bachelor programme in Energy Technology take an average of 7.7 semesters to complete their studies. In the Master degree programmes, the average duration of study is as follows: 10.9 semesters in the Energy Conversion Master programme, 11.1 semesters in the Bioenergy Systems Master programme, and 9.6 semesters in the Nuclear Engineering Master's programme. No data is available for the Bachelor degree programme in Energy Technology DD, as it only started in 2021. The experts note with concern the long study times; especially in the Master programmes, students take on average two to three times as long as the standard study period to complete their studies. The programme coordinators explain that the statistics for Master programmes often include the time it took students to complete their Bachelor studies as well. However, this is unlikely to be the case as, for example, graduates of the Master programme in Nuclear Engineering took 5 semesters to complete their studies in 2018 and 8.4 semesters in 2020. Since the Bachelor and Master programmes together would take at least 10 semesters, students would thus have completed their studies in almost half the time. The programme coordinators assure that they will check the data again for accuracy. They add that many students have part-time jobs alongside their studies, which could be

one reason why many students need more time to complete their programme. Students in the audit report that there are no structural problems in the organisation of the programmes that hinder them to finish their studies within the expected timeframe. They confirm the impression of the programme coordinators that the majority of students work alongside their studies. Often their work is in a field related to their profession. Therefore, they choose to invest a significant amount of time in their part-time job in order to improve their chances on the job market after graduation. Furthermore, the students inform the peers that many students choose to take more time than intended for the Master thesis particularly when carrying out their Master project at a company. In this case, students might decide to elongate their research and experimentation time at the company before writing their thesis. In some cases, students are even required by the company to work for a certain amount of time before they can start their thesis project, which would also lead to an elongation of the study time. The experts are glad to hear that the long study time seems to be largely traced back to the students' own decision and actions. Nonetheless, they agree that LUT must establish an official system that assesses the reasons for the long duration of the studies.

The experts also note that LUT has not provided statistics on dropout rates in the programmes reviewed. The programme coordinators explain that there are occasionally students who voluntarily leave the programme because they decide to transfer to another programme or university or to enter the labour market early. However, it has been difficult to determine these dropout figures for LUT as students do not explicitly communicate this to the university. The experts understand the problem and the arguments of the programme coordinators. However, they agree that it is necessary to monitor the dropout rate in all programmes officially and to assess the reasons for dropping out in order to evaluate the development of the total number of students and to identify possible problems in the programmes related to dropouts.

When asked about the workload in the five programmes, students indicate that they are generally satisfied with the workload, which is generally evenly distributed and corresponds to the ECTS credits awarded. However, students point out that the laboratory courses in the bachelor programmes require a disproportionate amount of work. They explain that most laboratory courses take place in the spring semester and are awarded 3 ECTS credits per course. In order to obtain these credits, students have to submit up to three reports of up to 25 pages per course. The students complain that the actual amount of work involved in carrying out the laboratory work and writing the reports does not correspond to 3 ECTS points. The experts agree with the students and demand that the workload must be aligned with the credit points awarded. They suggest distributing the lab

courses over the entire academic year, as the workload is, according to the students, more concentrated in the spring semesters due to the demanding nature of the lab courses

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

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

Preliminary assessment and analysis of the peers:

The learning method applied in the programmes under review is a combination of teacher-centred learning (TCL) such as classroom teaching/tutorials, demonstrations, laboratory sessions, and student-centred learning (SCL) such as group discussions, case studies, project-based learning, and laboratory work. Each course can use one or a combination of several teaching and learning methods.

The most common method of learning in the Bachelor's degree programmes is class session, with several courses offering project and laboratory work. The aim is to give students the tools to study and solve problems independently. Therefore, various teachers use problem-based learning, group projects, discussion groups, and report writing.

In the Master's degree programmes, more student centred learning models are applied in order to improve students' analytical and scientific skills. To this end, in most courses didactic methods such as cooperative learning, case studies, and project based learning are applied. Giving a presentation and peer-evaluation are also utilised on Master's level. Problem based learning and continuous assessment are applied as pedagogical methods in several courses. There are also a variety of laboratory assignments.

Course feedback, which takes place each semester, gives students the opportunity to evaluate teaching methods and make suggestions for improvement.

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

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

In terms of the workload, the auditors have identified several inconsistencies and discrepancies. With regard to the requirement that all modules must have the same work load per credit, LUT has stated that the errors found in the declared student workload have been corrected for the new academic year 2023/24 and revised module descriptions have been submitted as evidence. They explain that the modules of all programmes examined now have a uniform workload of 27 hours per 1 ECTS. The experts appreciate the adjustments and confirm that the requirement is met. Since the LUT has not issued a statement on the experts' demands for adjusting the workload-ECTS correlation of the laboratory courses and the internship in the Bachelor's degree programmes, these requirements remain in place.

The experts also recommend monitoring the dropout rate and setting up a system to identify the reasons for the long duration of studies. LUT has responded to this recommendation by stating that the statistics will soon be revised so that the background information on graduates will be clearer in order to differentiate between the graduates who completed their Bachelor's and Master's degree at LUT and those who solely completed their Master's degree at LUT). In addition, LUT reports that it, the Department of Energy Technology, will work with student advisors to develop ways to support students whose progress seems to be delayed. The auditors note positively that LUT is aware of the complex problem of the long study times of its students and that monitoring measures and measurements are underway. Nevertheless, they cannot see any concrete implementations, which is why the recommendation remains.

With respect to the curricula of the programmes under review, the auditors have found only mild points to improve. They recommend to integrate more environmental issues in the curricula. In addition they suggest synchronizing related course content to avoid repetitions of content across modules since students complained that often topics are repeated across different modules.

Since the number of outgoing students in the Bachelor's programmes are relatively low, the experts recommend introducing a window for mobility; this should simplify the process of mobility and recognition of achievements. They also suggest informing international students in more detail about the internship system in Finland so that the students can start preparing early on for the organization of the internship.

Criterion is partly fulfilled.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Module descriptions
- LUT Degree Regulations
- Discussions during the audit

Preliminary assessment and analysis of the peers:
At LUT various methods of examination are used. This includes written examinations such as essays, case studies and calculation problems. In addition, laboratory work reports, learning assignments, group work, project work, literature reviews and seminars are also used depending on the competences that should be imparted and evaluated. Examinations (written or online) mainly test students' theoretical and problem-solving skills, while reports and essays test their logical thinking, innovativeness, analysis skills and broader understanding of the subjects in question. Continuous assessment is used in several courses to assure continuous accumulation of students' knowledge, skills and competence. The examination methods used in the different courses are described in the respective module descriptions (study guide) that are available to the students via eLUT.

The most common examination type is a written examination, which includes essays, problem-solving or case-based questions and calculation problem. The standard duration of "traditional" written examination is three hours. The assessment methods are more varied in the Master's programmes, while in the Bachelor's the most typical assessment forms are written exams, assignments, and quizzes. In Master's programmes, more independent studies and the demonstration of advanced knowledge and skills are required. An increasing number of teacher uses continuous evaluation methods such as exercises, laboratory work, group and project work and learning tests.

In the audit, the experts inquire whether the courses also offer oral examinations. The students explain that the only form of oral examination used is presentations. Otherwise, oral examinations are not offered in either the Bachelor or the Master programmes. The experts recommend that oral examinations should also be used as an examination method in order to increase the variety of examination types and the range of competences assessed.

Courses are evaluated either on the scale excellent (5), very good (4), good (3), satisfactory (2), sufficient (1) and failed (0), or pass – fail. On the five-point scale where 100 points is the maximum, the grade 5 requires 90–100, and 50 points are required to pass the course.

The total score may be determined by a combination of, for instance, an examination, exercises, home assignments, and seminars. Students are entitled to receive information on their grades and have the right to view their evaluated and graded work. If they are not satisfied with the grading, they can request a revision of the grade and may submit a further appeal with the Degree Board within 14 days of receiving of the grade. Students have the right to take part in three examinations for each course they take. Students who fail to pass an examination after taking it three times may apply for an additional retake. The further details are described in the LUT degree regulations.

Examination and teaching periods are annually announced by the vice rector of education and published on eLUT. There are altogether six examination weeks during the academic year, plus an additional examination week for re-sits in summer. Students are informed about the exam dates via the Academic Calendar and can enrol for courses and examinations in the university student register “Sisu”. Here, students can access their grades and the weighted average of their studies at any time. LUT has defined guidelines and procedures to support students with learning disabilities and special needs. Documented learning disability diagnoses will be taken into consideration in examination arrangements.

Every student at LUT is required to do conduct a research project, which is carried out as a Bachelor thesis and seminar (10 ECTS) or Master thesis and seminar (30 ECTS).

The Bachelor thesis is a scientific work report written by students in the Bachelor programme that focuses on a specific topic and usually consists of literature study, practical research, data analysis, and presentation in figures or tables as well as writing the thesis under the supervision of a teacher. Both the student and his /her supervisors might decide the topic and content of the project. In many cases, the lecturers offer particular topics connected to their research. The students have to present their results in the thesis seminar.

The Master thesis is an academic paper, which includes an independent in-depth study of a scientific topic and which creates innovation or provides new contributions to the scientific or technological development of respective scientific area. The Master thesis is conducted with the guidance of the thesis advisor and requires six months of full-time work. Master thesis and seminar belong to the specialisation studies of the respective Master’s programme.

For the grading of the thesis, LUT has established an assessment matrix as a guiding tool for both internal and external supervisors involved in the grading process, thus fostering a transparent and comparable grading of the theses.

The peers also inspect a sample of examination papers and final theses and are overall satisfied with the general quality of the samples.

In summary, the peers confirm that the different forms of examination used are competence-oriented and are suitable overall for verifying the achievement of the intended learning outcomes as specified in the respective module descriptions. The form of examination is determined individually for each course and published in the respective module description. The programme coordinators evaluate the relevance of assessment methods regularly as a part of their annual curriculum work. The forms of examination are based on the main content of the modules and the level is appropriate for the respective degree programme.

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

Nevertheless, they recommend that oral examinations be offered in all the study programmes under review in order to broaden the range of competences tested for the students.

Criterion is fulfilled.

3. Resources

Criterion 3.1 Staff and Development

Uk?Evidence:

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

Preliminary assessment and analysis of the peers:
According to the Self-Assessment Report, the academic staff at LUT consists of professors, associate/assistant professors, post-doctoral researchers and PhD-students. In addition, there are several visiting professors at the School of Energy Systems such as from the co-operating HEI HEBUT.

The composition of teaching and research personnel at LUT is based on a tenure track system. The tenure track is a professor's pathway to promotion and academic advancement. It's the process by which a lecturer becomes an assistant or associate professor and then a

full professor based on their teaching record and research activities. The members of the teaching staff are either employed in a tenure track position or a non-tenure track position. Non-tenure track positions are either research or teaching oriented, based on the needs of the School of Energy Systems.

According to the Self-Assessment Report, the School of Energy Systems has currently 300 full-time employees. The Department of Energy Technology that is responsible for organising the five degree programmes under review employs 60 academic staff members.

The composition of the academic staff members in the Department of Energy Technology is presented in the table below.

	Total number of positions / Energy Technology
Professors	6
Associate/Assistant Professors	13
Post-doctoral researchers	18
Doctoral Students	23
Total academic staff	60

In addition, there are 14 Assisting Teachers from HEBUT, who offer classes to students in the Double Degree programme. Details of the academic qualifications of the teachers are described in the staff handbook.

The teaching staff is supported by laboratory staff, who helps with analysis, takes care of the facilities and maintains the infrastructure in the laboratories. Other administrative and supporting functions of education and research have mainly been centralised in the LUT University Services Unit.

Every degree programme has a study coordinator to support the programme management and a study counsellor to advice students to plan their studies and help in any study related matter. Together with the head of the degree programme they assure the quality of curricula and find ways to help students progress in their studies.

In addition, there are centralised support units at LUT, such as the Language Centre, Academic Library, Communications and Media Services, IT Services, Financial Services, International Office, and HR Services.

The peers review the qualifications of the academic staff members and conclude that the composition and qualification of the teaching staff is suitable to sustain the Bachelor degree programmes as well as the Master degree programmes. Furthermore, they note that there is sufficient administrative and counselling staff and facilities for the support of students.

In the audit, the experts enquire about the teaching workload of teachers. The teachers explain that their workload is very individual and depends on the respective status of the teacher. On average, teachers spend 4 hours per week directly teaching in the classroom, in addition to preparation and follow-up. Currently, the student-teacher ratio is about 1:20 in Bachelor programmes and 1:15 in Master programmes. However, classes with up to 40 students in the Bachelor's programmes may deviate from this ratio. Teachers report that the overall teaching workload has increased in recent years as the number of students has risen significantly while the number of teachers has remained the same. Furthermore, in addition to teaching and supervising students, all teachers are expected to be active in research and publication. Overall, this results in a tight schedule for teachers. They therefore express the wish to be able to invest more time in teaching in order to maintain the quality of their teaching. The experts understand the situation of the teaching staff and recommend that LUT monitors the workload of the teaching staff and ensures that the increasing number of students is matched by the number of teaching staff. Overall, LUT needs to ensure that teachers have enough time to concentrate on their main task, which is teaching, so that the quality of teaching can be maintained.

As mentioned in chapter 1.3 of this report, the experts note that the Mathematics and Physics courses are only taught by teachers with a Master degree. They demand that at least the module responsible for these courses must have a PhD or higher degree to ensure high quality and academic level of the respective courses.

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

Students indicate during the audit that they are generally satisfied with all the support services offered by LUT. They appreciate the friendly atmosphere between students and university members and the noticeable efforts of all staff to provide students with a great study experience. However, the students remark on the separation created by the fact that the students in the Double Degree programme are housed in Lahti and the students in the other programmes in the Department of Energy Technology are located in Lappeenranta; two cities that are about 150 km apart. The students of the Double Degree programme report that they sometimes feel left out or even neglected because the majority of the other students is in Lappeenranta. As Lappeenranta is the main campus and the centre of the energy programmes, most events and facilities take place there. The students also report a case where a course was held in Lahti but for the exam they were required to drive to Lappeenranta. The experts therefore recommend that the Double Degree students should be more integrated into campus life in Lappeenranta and should receive the same teaching and support conditions as the students at the Lappeenranta campus.

Staff Development

LUT provides several opportunities for its staff members to improve their teaching competences and to develop their didactic and professional abilities. The university has a "Dialogue Meeting" through which the staff members are included in the decision-making concerning the development of the working environment and conditions. The committee's duty is to assess and develop occupational work safety and health care, and personnel training. The committee annually revises the measures for professional development and maintaining professional expertise. Training courses are communicated on LUT's intranet, and are thus available to all staff members. For example, trainings for thesis supervision, IT-tools, and project management have been arranged in recent years. Additionally, there are special trainings for teaching staff focusing on effective teaching, where teachers can generate new ideas for implementing teaching and examinations and share good practices. The aim is to offer high quality teaching by using modern methods and tools. In the audit, the teachers state that most of them have attended the basic didactic courses. In general, the course offer is very much appreciated and regularly used by the teachers.

They also express their overall satisfaction with the support mechanisms and mention that research budgets allow for going abroad and visiting other research groups. Yet, as explained before, due to the high teaching workload, many teachers find it difficult to carry out a sabbatical as they have to find ways to replace their teaching. When asked about the specific research projects of the teachers, the experts learn that the teachers are involved in a variety of projects cooperating with companies, research networks, and other universities both on a national and international level. One exemplary project is on fluid mechanics and heat transfers. According to the self-assessment report, the Department of Energy Technology produced 52 publications in 2021.

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

Criterion 3.2 Funds and equipment

Evidence:

- Self-Assessment Report
- Staff Handbook
- Study plans
- Module descriptions

- Discussions during the audit

Preliminary assessment and analysis of the peers:

The Dean of the School of Energy Systems is responsible for budgeting and allocating resources to the school's activities, departments, and laboratories. The annual revenue of the school is about 37 million euros. Most of the money needed for running the degree programmes comes from the university budget, which is received from the Finnish Ministry of Education and Culture. Approximately 49 % of the school's funding comes from external sources (17.4 million euros in 2021), including research funding from the Academy of Finland, the Finnish Funding Agency for Technology and Innovation, the European Commission and private companies. In addition, the university has an investment programme to support investments for research and teaching equipment.

The university has two campuses, in Lappeenranta and in Lahti. In Lappeenranta, LUT has 21 lecture halls, 10 computer classrooms and an exam room for online exams. In Lahti, there are 44 lecture halls, 14 computer classrooms and an exam room for online exams. A highlight of the Lappeenranta campus is the J. Hyneman Center (JHC). The goal of this prototype laboratory is to give students and researchers a shared space, where they can create new ideas and test prototypes. The experts appreciate this innovative hub that encourages students to develop their own projects.

During the audit, the experts visit the facilities at the campus in Lappeenranta. Altogether the department of Energy Technology includes several laboratories with 14 professorships. They confirm that the laboratories are well equipped and well maintained. There are enough working places available for all students. The research capacity of the laboratories is high and sufficient for carrying out various research projects and offering final projects. The joint use of instrumentation for research and teaching is well organized and a good practice. The students and teachers mirror the good impression by the experts and report to be very satisfied with the laboratories and the equipment.

LUT Academic Library is the joint library for the LUT University and LAB University of Applied Sciences. The library operates in Lahti and Lappeenranta and provides library services in different specialist fields for students, staff, researchers, and the general public. It is also one of the European Documentation Centres in Finland. In Lappeenranta, the library has silent workplaces, several group work facilities, and a room for students writing their thesis. In Lahti campus, these study areas are mainly situated outside the library. The library is open for students and staff members 24 hours a day, seven days a week.

Finally, the university premises in Lappeenranta also include restaurants, a student health care centre, two sports halls and a gym. The Student Union House has an office and facilities for recreational activities and meetings that are available to all students.

In summary, the expert group judges the available funds, the technical equipment, and the infrastructure (laboratories, 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 3:

Overall, the experts are largely satisfied with the staff and resources allocated to the study programmes under review. However, they agree that each module responsible must be a member of the university having a PhD.

Furthermore, they recommend to monitor the workload of the teaching staff and to match the increase of the students to the number of the teaching staff so that the quality of teaching is maintained.

As students at the Lahti campus reported that they sometimes feel unfairly treated or neglected compared to students at the main campus in Lappeenranta, the auditors recommend that students at the Lahti campus should be offered the same teaching and support conditions.

Criterion is predominantly fulfilled.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Evidence:

- Self-Assessment Report
- Module descriptions
- Websites of all study programmes

Preliminary assessment and analysis of the peers:

The students, as all other stakeholders, have access to the module descriptions (study guide) via eLUT.

After studying the module descriptions the peers confirm that they include all necessary information (course name, course code, students' total workload, awarded ECTS points, teaching language, grading scale, intended learning outcomes, content, possible prerequisites, name of teacher/teachers in charge, exam methods, and assessment criteria). However, the peers note that recommended literature is not assigned to each module. In addi-

tion, the peers note that the module descriptions, as mentioned in chapter 1.3 of this report, do not accurately reflect the content of the modules: Contrary to the lack of information in the module descriptions, a high number of modules in all degree programmes deal with sustainability and environmental issues. In general, the experts note that the content descriptions of the modules are relatively brief and do not allow for an in-depth understanding of the module content or its academic level. The experts conclude that the module descriptions need to be revised so that all modules include information on recommended literature as well as accurate and more detailed information on the content of the module.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Exemplary diploma certificate per study programme
- Exemplary diploma supplement per study programme
- Exemplary transcript of records per study programme

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

LUT's Diploma Supplement complies with the model developed by the European Commission, the Council of Europe and UNESCO and it includes a description of the Finnish education system prepared by the Finnish National Agency for Education and approved by Finland's Ministry of Education and Culture.

Students who graduate from a Master's programme in English receive a degree certificate in Finnish and English. Students who graduate from the Finnish-language Bachelor's programme receive a certificate in Finnish and an English translation.

Criterion 4.3 Relevant rules

Evidence:

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

Preliminary assessment and analysis of the peers:
The auditors confirm that the rights and duties of both LUT and the students are clearly defined and binding. All rules and regulations are published on the university's website and the students receive the course material at the beginning of each semester.

In addition, all relevant information about the degree programmes (e.g., module handbook, study plan, intended learning outcomes) is available on the homepage of the programmes.

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

In conclusion, the experts require that the module descriptions of all programmes are revised so that they inform in more detail about the module content and include recommended literature. In general, the module descriptions must transparently match the actual module content.

Criterion is partly fulfilled.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- LUT Degree Regulations
- LUT Quality Manual
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The highest panel at LUT is the University Board, which has nine members, five of whom are external to the university community, and four have been elected from different groupings within the university. The LUT administration is headed by the Rector, who is responsible for implementing and supervising all academic processes at LUT. The Rector is supported by the Vice Rector for Research and Innovation and the Vice Rector for Education.

The Vice Rector for Education bears the university-wide responsibility for the development of degree programmes, the programme portfolio, and curriculum work. The vice rector

gives instructions and guidelines on the development of curricula and regularly meets with the Director for Study Affairs and the heads of the degree programmes to discuss issues concerning the teaching and learning processes. In addition, members of the Student Union and study services representatives meet regularly. The Vice Rector for Education participates in most of these meetings.

On school level, there is the Academic Council which is authorized to formulate policies and to monitor all academic activities at school level, in this case the School of Energy Systems. The Dean is the head of the school with the authority and responsibility for administering all teaching and learning activities within the school. On school level, there is a steering group consisting of the heads of the degree programmes, which is chaired by the Dean. Similarly, there is a steering group in the Department of Energy Technology, which is chaired by the head of the degree programme and which is responsible for implementing the curricula and all related educational activities. Student representatives from the Energy Technology students guild are invited to these meetings to discuss about possible changes in programmes but also to get current feedback from the students about the teaching and learning processes. Finally, for each degree programme there is the Head of Degree Programme, who is responsible for implementing all educational activities within the respective degree programme.

The peers discuss the quality management system at LUT with the heads of the study programmes, they learn that there is an institutional system of quality management aiming at continuously improving the degree programmes.

This system relies on internal as well as external quality assurance. The LUT quality management system has undergone an external audit of the Finnish Education Evaluation Council three times – in 2009, 2015, and 2021. In addition, LUT focuses on international accreditation of its degree programmes

Internal quality assurance relies on students' and stakeholders' feedback, which is discussed in quality workshops with the goal of enhancing the programmes' quality and promoting their further development. The assessment is based on an analysis of programme performance indicators and stakeholders' feedback. The head of the respective degree programme and relevant programme managers together with students' representatives conduct the review and provide a critical report with development targets, actions to be taken and persons responsible for the implementation. Students' representatives in administration are elected among the students to represent the whole student community in various panels, for example the University Board or the Academic Council. Students' representatives are required by the Finnish Universities Act, which states that in the University Board

as well as in administrative bodies of faculties there should be representatives of professors, other staff members, and students. Students' representatives are equal members of the administrative bodies and bring the students' viewpoints into the discussions.

All degree programmes at LUT are evaluated systematically according to performance indicators such as the number of graduates and applications, progress of studies, students' and stakeholders' feedback, and employment rate of graduates.

Internal assessment of the quality of the degree programmes is mainly provided through students' questionnaires. The students give their feedback on the courses by filling out the questionnaire online each semester. Students assess various aspects such as quality of the degree, quality of teaching, quality of guidance, and satisfaction with student life. In addition, teachers are able to add their own questions to the questionnaires if they want to get feedback e.g. on specific teaching methods applied in the course. Course-specific feedback reports are delivered via Moodle to the teachers responsible for the courses. The head of the degree programmes has the right to monitor all course feedbacks of the programme. If an individual course receives a low average score (less than 3.3), the reasons will be reviewed thorough and further action will be taken to improve the situation. After the teachers have received the feedback report on their own course, they are expected to give a response to the feedback to inform students about conclusions and development actions based on the feedback. The aim is to encourage and motivate students to give course feedback more actively, since in many cases the response rate is too low to make justified conclusions for improvement. In 2022, LUT has introduced a new course feedback tool integrated in the Moodle platform to ease and activate students giving feedback. In addition, also graduating students and alumni are asked to fill out online questionnaires concerning their academic experience in the degree programmes.

The students confirm during the audit that questionnaires are carried out regularly and that they are invited to join quality workshops. Yet, they criticize the timing of the evaluation and the feedback-loop: currently, the surveys are conducted directly after the course and the results of the evaluation are passed on by the teachers to the students in written form at the beginning of the new semester. Some teachers also communicate the changes made on the basis of the last evaluation at the beginning of a new course. However, the students would like the questionnaire to be conducted in the middle of the semester and the results to be discussed together in class before the end of the course. This way, students would see a direct effect of their feedback and benefit from the changes implemented. The students affirm during the audit that this would increase the incentive to participate in the surveys.

During the audit, the experts discuss with industry representatives their involvement in the quality management of the programmes. They report that they rarely receive invitations to participate in surveys and therefore cannot really contribute to the development of the programmes. In general, however, they indicate that they are very satisfied with the qualifications of LUT students and graduates. In fact, they would like to see more LUT students and graduates applying to their companies for internships, traineeships or full-time positions. The experts ask whether they have made use of the "Job Teaser" platform. The platform is comparable to a virtual blackboard where companies can post internship or job offers. Students can access this platform and apply directly to the companies when they see an interesting offer. The industry representatives present state that they are not aware of this platform. The experts therefore suggest LUT to better communicate the "Job Teaser" website to increase the reach of the recipients. The experts also recommend that stakeholders should be more involved in the quality management of the programmes. Apart from being surveyed on a regular basis, the industry partners should also be directly and bindingly integrated into the internal quality system. The experts suggest establishing a joint advisory board consisting of the programme directors and representatives of the students as well as the industry. This ensures that all parties involved are continuously represented in the assessment of the degree programmes.

The evaluators gain the impression that the quality system of the LUT functions well overall and ensures high quality and continuous further development of the study programmes. The feedback is taken into account by the programme coordinators and changes are made instantly. They confirm that LUT regularly monitors and reviews the degree programmes and the modules to ensure that they achieve the objectives set for them and respond to the needs of the students.

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

The experts conclude that the LUT takes all necessary measures to ensure transparent documentation and publication of the relevant documents for all stakeholders. However, the auditors recommend to carry out the teaching evaluation in the middle of the semester and communicate the results to the students before the end of the semester. They also suggest to stablish a joint advisory board consisting of the programme directors and representatives of the students as well as the industry.

Criterion is fulfilled.

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution (24.08.2023)

The following quotes the comment of the institution:

"**Criterion 1.5 Workload and credits**

Inconsistencies between workload and ECTS

Report: "When reviewing the module descriptions, the experts found inconsistencies in the allocation of the workload per ECTS point for several modules. For example, the "Electrical Circuits module" in the Bachelor's degree programme in Energy Technology is credited with 4 ECTS. The stated total work- load is 104 hours. This results in a correlation of 26 hours per ECTS point. The module "Engineering Mathematics" 1 is credited with 3 ECTS points for a total workload of 90 hours. This results in a correlation of 30 hours per ECTS point. The experts therefore insist that each module has the same ratio of workload and credit points."

LUT: The errors found in the declared student workload of the courses have been corrected for the 2023- 24 curriculum (follow the links: "Electrical Circuits module", "Engineering Mathematics"). The consistency of credits and hours are to be assured in the curriculum work process by the study coordinator and head of the degree programme.

Assessing the long duration of studies

Report: "Nonetheless, they agree that LUT must establish an official system that assesses the reasons for the long duration of the studies."

LUT: The statistics on graduation times are due to be revised in 2023. After the revision, it will be possible to distinguish between two types of Master's graduates: those who have started their studies at LUT already at Bachelor's programme and those who have come to LUT to take their Master's degree studies. After the revision, the reliable graduation times statistics can be uploaded and conclusions concerning the required actions are made.

At LUT, we already have a pretty good idea of the reasons for long duration of studies, because we ask about them in our graduate surveys. According to graduate surveys 2022, around 45% of energy engineering bachelor students have experienced a delay in their studies, the main reasons being working during their studies and lack of motivation. Almost 70% of Master of Energy Technology students report a delay of some months (typically 1-8 months), with the main reasons being working during their studies and difficulties in find- ing a place or subject for their Master's thesis. These rea- sons are well known, and various

services are available to address them. These include support from well-being services and teacher tutors to help with motivation issues and help from career services to find a thesis placement. Also, the professors often offer unpaid MSc thesis jobs in their research projects, but many students prefer to work in companies as paid thesis writers because it can open a desired career path. Thus, students prefer waiting/looking for a good job rather than taking up thesis topics offered by the university, which causes delay in studies. A common route to get a thesis placement is to contact a company where a student has already had a summer job. Professors can of course support also in finding an appropriate thesis job by advising where to apply for a position. In the Energy Technology department, there is established cooperation with companies, and thesis places are occasionally directly offered by them.

Monitoring of the drop-out rate

Experts: "The experts also note that LUT has not provided statistics on dropout rates in the programmes reviewed. The programme coordinators explain that there are occasionally students who voluntarily leave the programme because they decide to transfer to another programme or university or to enter the labour market early. However, it has been difficult to determine these dropout figures for LUT as students do not explicitly communicate this to the university. The experts understand the problem and the arguments of the programme coordinators. However, they agree that it is necessary to mon- itor the dropout rate in all programmes officially and to assess the reasons for dropping out in order to evaluate the development of the total number of students and to identify possible problems in the programmes related to dropouts."

LUT: In the study register, LUT has the data concerning students who have renounced their study right and all the heads of degree programme have access to the real time data. However, the data does not include information about any reasons for renouncing since the reasons are not even requested due to privacy protection rules. Below you can see the statistics on students who have started their studies at LUT but then renounced from the programmes during 2020-2023. As discussed in the onsite visit, we know that it does not tell the whole truth; there are students who quit their studies without informing the university.

	Year of renouncement			
Programme	2020	2021	2022	2023*
BSc	1	3	4	1
MSc Energy Conversion	1	1	1	0
MSc Bioenergy Systems	0	0	0	0
MSc Nuclear Engineering	0	0	0	0
TOTAL	2	4	5	1

Table: Number of Energy Technology students renounced the right to study in 2020-23

*) numbers by 15. August

In addition to students who have renounced their study right, there is a "passive students" statistic, which lists students who have not enrolled for a semester and have not completed any ECTS credits during the last academic year. The list of passive students can be used to determine the drop-out rate, but it should be noted that the situation may change for an individual student as he/she may return to being an active student after a 'quiet' semester.

Thus, we see that student drop-out is a very complex phenomenon (in Finland) and it is difficult to define unanimously who belongs to this group. Instructions in eLUT on study rights and absence policy can enlighten the complexity: https://elut.lut.fi/en/completing-studies/planning-your-stud- ies/study-rights. Instead of monitoring the dropout rates, LUT has invested in the study progress monitoring by cohort and by student (as described in the self-assessment report). The Department of Energy Technology, together with the study counsellors, will develop ways to support students whose progress appears to be delayed. Other departments in the school already have good practices that we can learn from."

F Summary: Peer recommendations (28.08.2023)

Taking into account the additional information and the comments given by 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 Energy Technology	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ba Energy Technology, DD	With requirements for one year	30.09.2029	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ma Energy Conversion	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ma Bioenergy Systems	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council
Ma Nuclear Engineering	With requirements for one year	30.09.2030	EUR-ACE®	Subject to the approval of the ENAEE Administrative Council

Requirements

For all degree programmes

A 1. (ASIIN 3.1) Each module responsible must be a member of the university having a PhD.

A 2. (ASIIN 4.1) Ensure that the module descriptions inform in more detail about the module content and include recommended literature. Revise the module descriptions so that they transparently match the actual module content.

For the Bachelor's programmes

A 3. (ASIIN 1.5) Ensure that the workload of the lab courses corresponds to the assigned CPs.

A 4. (ASIIN 1.5) Ensure that the workload of the internship corresponds to the ECTS points awarded.

Recommendations
For all degree programmes

E 1. (ASIIN 1.3) It is recommended to introduce a window for mobility.

E 2. (ASIIN 1.3) It is recommended to inform the international students in more detail about the internship system in Finland.

E 3. (ASIIN 1.3) It is recommended to integrate more environmental content in the curricula.

E 4. (ASIIN 1.5; 5) It is recommended to monitor the dropout rate and establish a system to assess the reason for the long duration of the studies.

E 5. (ASIIN 2) It is recommended to offer oral exams.

E 6. (ASIIN 3; 5) It is recommended to monitor the workload of the teaching staff and to match the increase of the students to the number of the teaching staff so that the quality of teaching is maintained.

E 7. (ASIIN 5) It is recommended to carry out the teaching evaluation in the middle of the semester and communicate the results to the students before the end of the semester.

E 8. (ASIIN 5) It is recommended to establish a joint advisory board consisting of the programme directors and representatives of the students as well as the industry.

For the Bachelor's programmes

E 9. (ASIIN 1.3) It is recommended to synchronize related course content to avoid repetitions of content across modules.

G Comment of the Technical Committees

Technical Committee 02 – Electrical Engineering/Information Technology (04.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the accreditation process and in particular requirement A1. While all agree that the module leader of a compulsory module should be a PhD holder, they argue about whether the module leader must also be a member of the university. On the one hand, it provides more stability and security if the person responsible is a member of the university. In this case, there is always a constant contact person and can take over as a substitute in urgent cases. On the other hand, the question arises whether we are restricting university policy and structure too much with this requirement. Finally, the majority of members agree with the requirement of the experts that all module supervisors must have a doctoral degree and should be a member of the university. They also accept the other requirements and recommendations defined by the expert group.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering/Information Technology.

The Technical Committee 02 – Electrical Engineering/Information Technology recommends the award of the seals as follows:

Degree Programme	**ASIIN Seal**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Energy Technology	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ba Energy Technology, DD	With requirements for one year	30.09.2029	EUR-ACE®	30.09.2029

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ma Energy Conversion	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Bioenergy Systems	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Nuclear Engineering	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029

Technical Committee 01 – Mechanical Engineering/Process Engineering (08.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and follows the assessment of the auditors in general. Regarding requirement 1 and recommendation 5 the committee suggests a more open wording.

Assessment and analysis for the award of the EUR-ACE® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 01 – Mechanical Engineering/Process Engineering.

The Technical Committee 01 – Mechanical Engineering/Process Engineering recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Energy Technology	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Energy Technology, DD	With requirements for one year	30.09.2029	EUR-ACE®	30.09.2029
Ma Energy Conversion	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Bioenergy Systems	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Nuclear Engineering	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029

Technical Committee 05 – Materials Science, Physical Technologies (12.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC discussed the requirements and recommendations proposed by the expert panel and followed the assessment of the experts with amendments. Concerning A1, the TC found the wording unclear and proposed some amendments. The TC emphasized that the requirement for a PhD was only a formal requirement, which could easily be fulfilled on paper. It emphasized that the fulfillment of the requirement should perpetuate the responsibility of a permanent member of staff to vouch for the quality of the module. This member should, of course, have an appropriate academic qualification, which should be at least one level above the level of qualification being sought. In addition, with regard to E9, the TC considered that it would be more appropriate to recommend a mixture of different types of examination. However, the TC was not sure whether there were specific reasons for this focus on oral examinations. Concerning E 11, the TC considered that the wording should be harmonized with the AC decision on feedback of teaching evaluation results. Finally, concerning E 13, the TC wondered whether there was a high level of repetition of content in modules and, in that case, considered that the recommendation should be a requirement. Some facts concerning E 9, E 11 and E 13 had to be clarified by the responsible project

manager during the AC meeting and could therefore not be dealt with in detail in this meeting.

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	Maximum duration of accreditation
Ba Energy Technology	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ba Energy Technology, DD	With requirements for one year	30.09.2029	EUR-ACE®	30.09.2029
Ma Energy Conversion	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Bioenergy Systems	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Nuclear Engineering	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029

H Decision of the Accreditation Commission (22.09.2023)

Assessment and analysis for the award of the ASIIN seal:

The Commission discusses the accreditation procedure and in particular requirement A1. The commission members argue about the extent to which it is legitimate and based on our criteria to require that the module supervisor is a member of the university and whether it is necessary for a module supervisor to have a doctorate. With regard to the latter aspect, the Commission decides that a module supervisor should have an academic qualification that enables him/her to ensure the appropriate level of the module, but exactly what that qualification should be depends on the nature and content of the module and cannot be defined in general terms. With regard to the first aspect, some members of the Commission consider it important that the person responsible for the module is a member of the university, as this ensures that the responsibility for the module is in the hands of someone who is permanently at the university, thus guaranteeing the stability of the module's offer and content. Other members, however, are of the opinion that this requirement would unnecessarily restrict the freedom of a university, as stability and quality can also be guaranteed by a temporary teaching assistant/external lecturer. Finally, the commission decides to follow the experts' opinion in this case and demand that all persons responsible for a module should be members of the university, as the main responsibility of the module should lie with a permanent member of the university who is familiar with the (administrative and technical) requirements for the modules; the teaching itself can still be done by an external lecturer. Furthermore, the commission recommends replacing the term issues with content to avoid the negative connotation.

Assessment and analysis for the award of the EUR-ACE® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committees 01 and 02.

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 Energy Technology	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ba Energy Technology, DD	With requirements for one year	30.09.2029	EUR-ACE®	30.09.2029
Ma Energy Conversion	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Bioenergy Systems	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029
Ma Nuclear Engineering	With requirements for one year	30.09.2030	EUR-ACE®	30.09.2029

*Subject to the approval of the ENAEE Administrative Council

Requirements

For all degree programmes

A 1. (ASIIN 3.1) Ensure that each person responsible for a module is a full-time member of the teaching staff and holds academic qualifications that allow them to guarantee the module's adequate level.

A 2. (ASIIN 4.1) Ensure that the module descriptions inform in more detail about the module content and include recommended literature. Revise the module descriptions so that they transparently match the actual module content.

For the Bachelor's programmes

A 3. (ASIIN 1.5) Ensure that the workload of the lab courses corresponds to the assigned CPs.

A 4. (ASIIN 1.5) Ensure that the workload of the internship corresponds to the ECTS points awarded.

Recommendations
For all degree programmes

E 1. (ASIIN 1.3) It is recommended to introduce a window for mobility.

E 2. (ASIIN 1.3) It is recommended to inform the international students in more detail about the internship system in Finland.

E 3. (ASIIN 1.3) It is recommended to integrate more environmental content in the curricula.

E 4. (ASIIN 1.5; 5) It is recommended to monitor the dropout rate and establish a system to assess the reason for the long duration of the studies.

E 5. (ASIIN 2) It is recommended to diversify the forms of exams.

E 6. (ASIIN 3; 5) It is recommended to monitor the workload of the teaching staff and to match the increase of the students to the number of the teaching staff so that the quality of teaching is maintained.

E 7. (ASIIN 5) It is recommended to carry out the teaching evaluation in the middle of the semester and communicate the results to the students before the end of the semester.

E 8. (ASIIN 5) It is recommended to establish a joint advisory board consisting of the programme directors and representatives of the students as well as the industry.

For the Bachelor's programmes

E 9. (ASIIN 1.3) It is recommended to synchronize related course content to avoid repetitions of content across modules.

For the Bachelor's programme Energy Technology (Double Degree)

E 10. (ASIIN 3) The same teaching and supporting conditions should be provided to students at the Lahti campus.

I Fulfilment of Requirements (24.09.2024)

Analysis of the experts and the Technical Committees (13.09.2024)

Requirements

For all degree programmes

A 1. (ASIIN 3.1) Ensure that each person responsible for a module is a full-time member of the teaching staff and holds academic qualifications that allow them to guarantee the module's adequate level.

Initial Treatment	
Peers	Fulfilled Justification: LUT explains that a thorough review of the documents and the website revealed that in some cases the academic title and CV of teachers were not up to date. They have now updated the information on all teaching staff on the website and in the module descriptions. In addition, LUT found a number of modules where the responsible teacher did not have a PhD. The responsibilities for these courses have been revised for the next academic year 2024-25 and a co-teaching model has been implemented to ensure the required academic level of the course. The experts appreciate the changes implemented by the LUT and consider that the requirement is fully met.
TC 01	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 02	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 05	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
AC	fulfilled Vote: unanimous Justification: The commission follows the vote of the experts.

A 2. (ASIIN 4.1) Ensure that the module descriptions inform in more detail about the module content and include recommended literature. Revise the module descriptions so that they transparently match the actual module content.

Initial Treatment	
Peers	Fulfilled Justification: LUT states that the module descriptions have been thoroughly reviewed and revised. The experts have reviewed the new module descriptions and find that the module descriptions are now more detailed, comprehensive, accurate and include literature recommendations. The requirement is therefore met.
TC 01	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 02	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 05	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
AC	fulfilled Vote: unanimous Justification: The commission follows the vote of the experts.

For the Bachelor‘s programmes

A 3. (ASIIN 1.5) Ensure that the workload of the lab courses corresponds to the assigned CPs.

Initial Treatment	
Peers	Fulfilled Justification: LUT states that the workload of all laboratory courses in the Bachelor’s programmes has been reviewed. The review showed that the student workload was indeed too high in some courses. As a result, it was decided to reduce the number and workload of laboratory assignments required of students. The new workload is now transparently defined in the module descriptions.
TC 01	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 02	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 05	fulfilled

	Vote: unanimous Justification: The TC follows the vote of the experts.
AC	fulfilled Vote: unanimous Justification: The commission follows the vote of the experts.

A 4. (ASIIN 1.5) Ensure that the workload of the internship corresponds to the ECTS points awarded.

Initial Treatment	
Peers	Fulfilled Justification: LUT states that due to the confusion of the internship system (both by experts and students), they have decided to remove the compulsory internship from the study programmes (from the next academic year 2024/25). Instead, students can apply for approval (maximum 2-6 ECTS) of the work experience they have had to be included in their degree structure as elective studies. The rules on how and what kind of work experience can be included in the degree are communicated for students in eLUT study portal and in Work experience course description. The experts approve of the new changes and deem the requirement to be fulfilled.
TC 01	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 02	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
TC 05	fulfilled Vote: unanimous Justification: The TC follows the vote of the experts.
AC	fulfilled Vote: unanimous Justification: The commission follows the vote of the experts.

Decision of the Accreditation Commission (24.09.2024)

Degree programme	ASIIN-label	Accreditation until max.	Subject-specific label	Accreditation until max.
Ba Energy Technology	All requirements fulfilled	30.09.2030	EUR-ACE®	30.09.2029
Ba Energy Technology, DD	All requirements fulfilled	30.09.2029	EUR-ACE®	30.09.2029
Ma Energy Conversion	All requirements fulfilled	30.09.2030	EUR-ACE®	30.09.2029
Ma Bioenergy Systems	All requirements fulfilled	30.09.2030	EUR-ACE®	30.09.2029
Ma Nuclear Engineering	All requirements fulfilled	30.09.2030	EUR-ACE®	30.09.2029

Appendix: Programme Learning Outcomes and Curricula

According to the Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programmes Energy Technology and Energy Technology DD:

“Education leading to the Bachelor's degree is based on scientific research and practices in the relevant professional field. The studies have provided students with:

1. knowledge of the intermediate and minor studies included in the degree, or knowledge of the basics of corresponding modules and studies in the degree programme and the ability to follow developments in the field,

2. extensive, advanced knowledge of their field and the capacity for understanding and critical ly assessing theories, key concepts, methods and principles

3. the capacity for scientific thinking and scientific approaches to work, taking ethical viewpoints into account,

4. the ability to apply what they have learnt to their work and international collaboration,

5. the ability to complete Master's level studies and for continuous learning, 6. good communication and language skills and the ability to head activities and projects.

The intended learning outcomes for the programme has been stated as follows:

After completing the Bachelor's programme in Energy Technology the graduates are able to

1) describe the physical basic phenomena related to energy technology,

2) apply basic equations of thermal engineering in the examination of energy conversion related processes, 3) describe the structure and operation principle of the equipment related to energy technology (boilers, turbines, compressors, fans, heat exchangers),

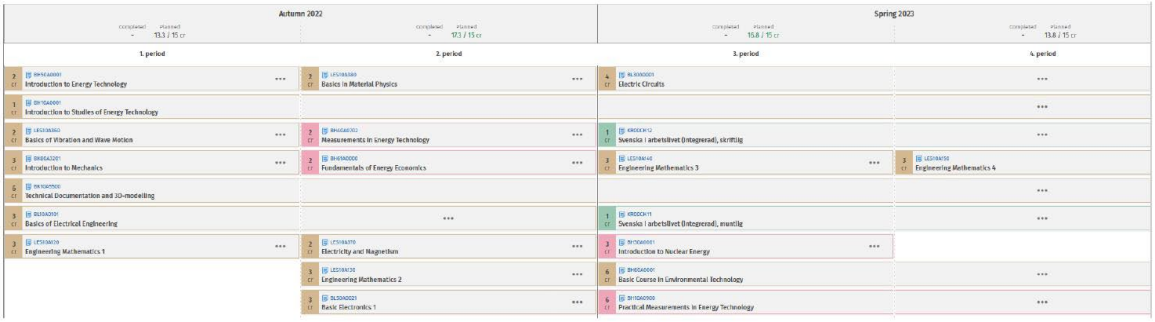
4) calculate operating values of equipment, define their design values, and understand their design principles, 5) describe the operation and design principles of various energy conversion processes,

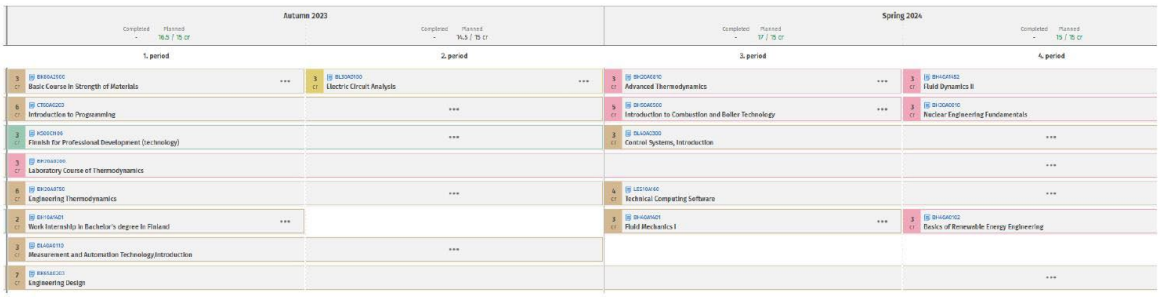
6) compare the applicability of various energy conversion processes to different applications from technological, economic and environmental perspectives,

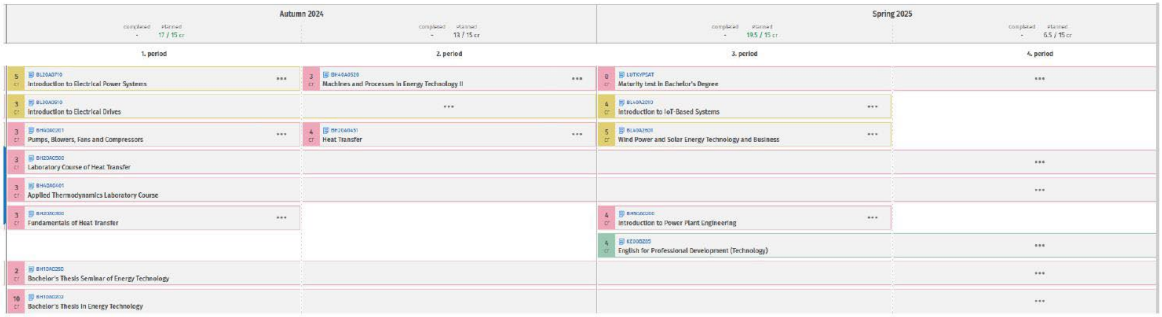
7) acquire information from various sources and evaluate their quality and reliability and

8) communicate both orally and in writing in national and international context.”

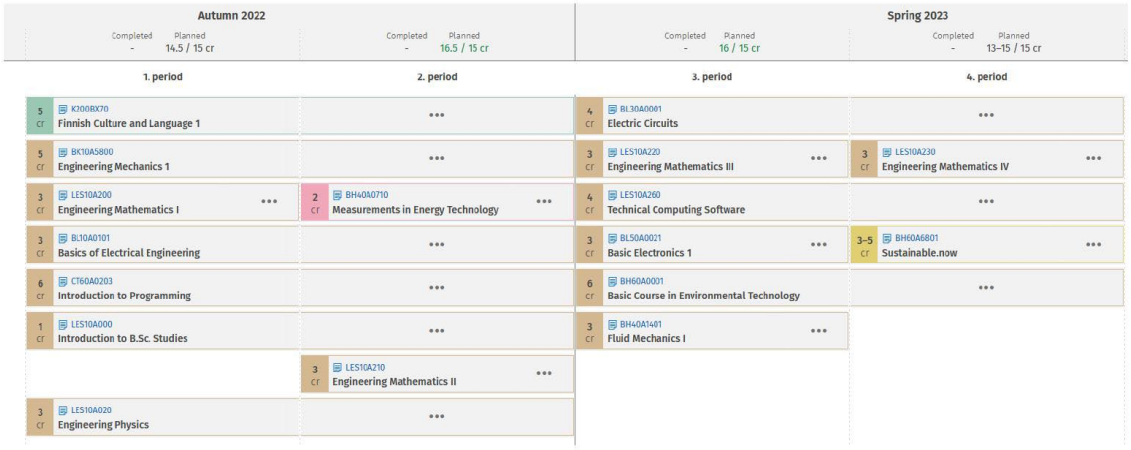
The following **curriculum** is presented:

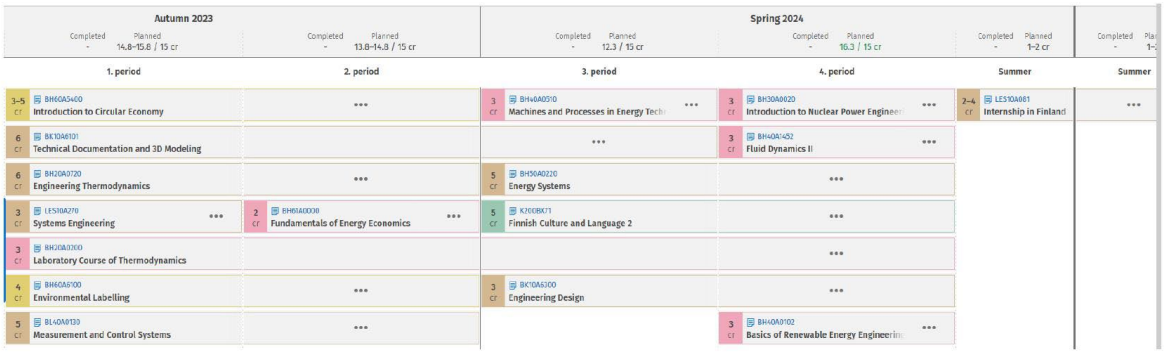


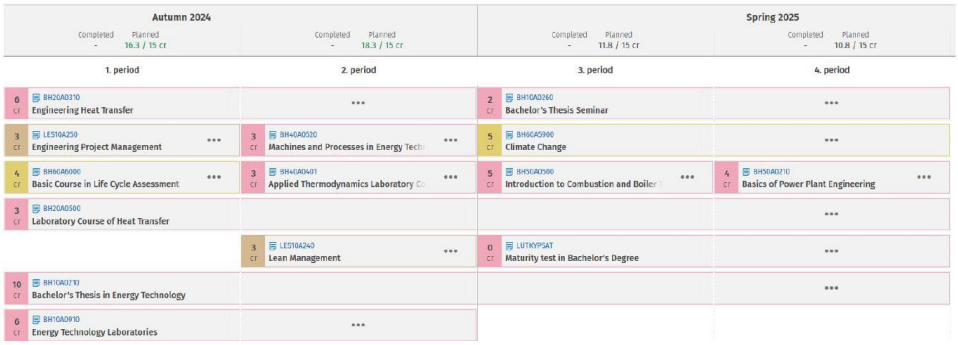




BSc DD in Energy Technology, curriculum 2022-2023
Workload/model scheduling of an example student from the partner university HEBUT with selected minor (Sustainability Science)







According to the Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme Energy Conversion:

“The studies leading to the degree provide students with

1) a good knowledge of their major subject/advanced studies and a fundamental knowledge of their minor subjects,

2) the ability to apply scientific knowledge,

3) the ability to take on duties as an expert in and developer of their professional field,

4) the capacity to carry out scientific postgraduate studies,

5) good communication and language skills, and

6) good presentation, cultural and leadership skills.

The studies are based an research and professional practices in the field in question, and promote team and project work skills. After completing the Master's programme in Energy Conversion the graduates are able to

1) analyse, design and select energy conversion processes for different applications, taking technological, economical, environmental and societal aspects into account,

2) apply and develop mathematical models to solve energy technological problems,

3) manage and organize both national and international projects,

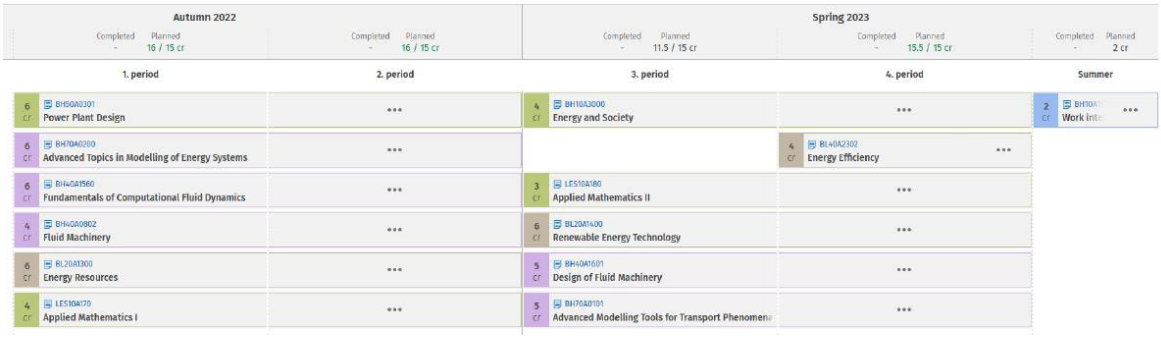
4) design energy technology related equipment, plants, processes and systems,

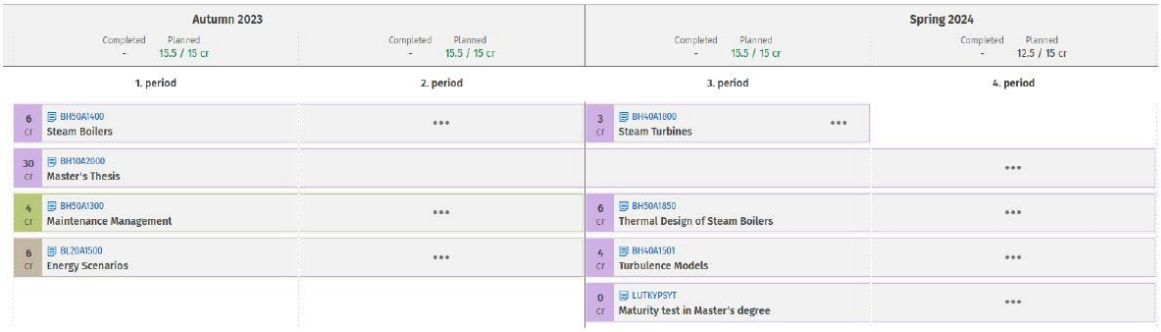
5) communicate and act in academic and research environments and

6) work as specialist in energy technology."

The following **curriculum** is presented:

MSc in Energy Conversion, curriculum 2022-2023
Workload/model scheduling of an example student continuing from LUT BSc with minor (Renewable Energy and Energy Efficiency)





According to the Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme Bioenergy Systems:

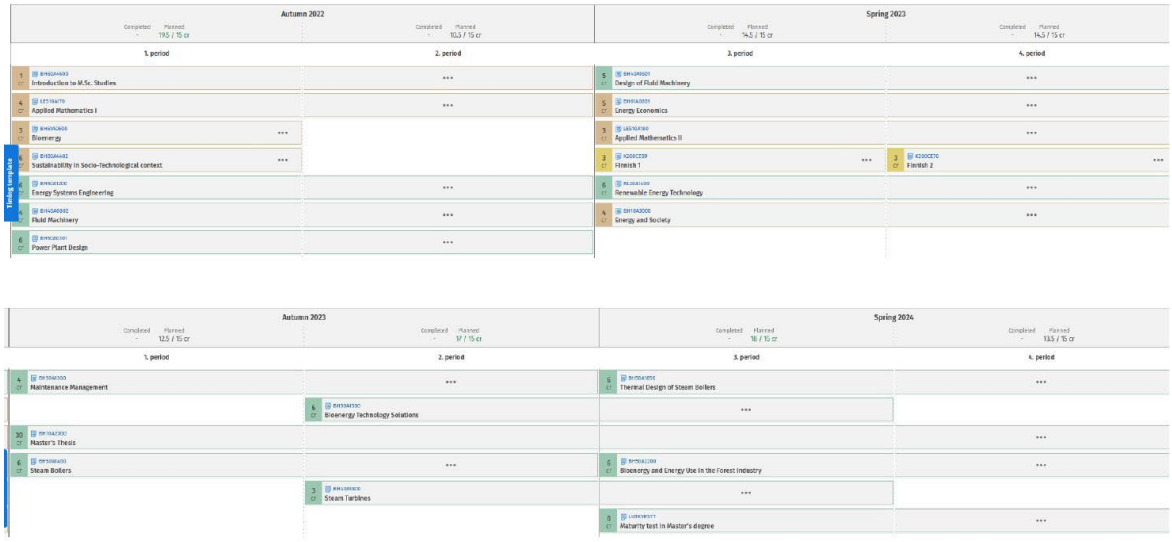
“Education leading to the Master's degree is based on scientific research and practices in the relevant professional field. The studies have provided students with:

1. a good command of their core and advanced specialisation studies and the basics of their minor studies , 2. a good command of extensive and highly specialised concepts, methods and knowledge of their field 3. the ability to apply scientific knowledge creatively, solve problems, develop new solutions, and examine phenomena critically, taking ethical viewpoints into consideration 4. the ability to operate independently as an expert and developer and/ or entrepreneur in their field, also in an international working environment 5. the ability to go on to complete scientific postgraduate studies and develop their skills continuously 6. excellent interaction, communication, language, teamwork and project work skills and be able to manage issues and/or lead people.

After completing the Master's programme in Bioenergy Systems the graduates are able 1) analyse, design and select energy conversion processes for different applications, taking technological, economical, environmental and societal aspects into account, 2) apply and develop mathematical models to solve energy technological problems, 3) investigate and design small-scale bio-energy systems, 4) understand what prerequisites various bio-fuels sets for their utilization (processes and equipment), 5) take part in strategic planning at a national level to increase the use of bio-energy nationally, 6) understand and explain the benefits and drawbacks of different bio-energy generation technologies, 7) manage and organize both national and international projects, 8) design energy technology related equipment, plants, processes and systems, 9) communicate and act in academic and research environments and 10) work as specialist in energy technology.”

The following **curriculum** is presented:

MSc in Bioenergy Systems, curriculum 2022-2023
Workload/model scheduling of an example student with no minor as specialization studies exceed 80 ECTS



According to the Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme Nuclear Engineering:

"The studies leading to the degree provide students with 1) a good knowledge of their major subject/ advanced studies and a fundamental knowledge of their minor subjects, 2) the ability to apply scientific knowledge, 3) the ability to take on duties as an expert in and developer of their professional field, 4) the capacity to carry out scientific postgraduate studies, 5) good communication and language skills, and 6) good presentation, cultural and leadership skills. The studies are based on research and professional practices in the field in question, and promote team and project work skills.

After completing the Master's programme in Nuclear Engineering the graduates are able to 1) utilise different numerical methods of reactor physics and thermal hydraulic safety analysis, 2) understand the nuclear fuel cycle, 3) understand and explain the design principles of nuclear reactors, nuclear steam supply systems and safety systems, 4) understand protection against ionizing radiation, 5) apply and develop mathematical models to solve energy technological problems, 6) manage and organize both national and international projects, 7) design energy technology related equipment, plants, processes and systems, 8) communicate and act in academic and research environments and 9) work as specialist in energy technology."

The following **curriculum** is presented:

MSc in Nuclear Energy, curriculum 2022-2023
Workload/model scheduling of an example student with minor (Modelling of Energy Systems)