ASIIN Seal & Euro-Inf® label

Accreditation Report

Bachelor's Degree Programmes
Software Engineering
Software and Systems Engineering (Double Degree)

Master's Degree Programmes
Software Engineering and Digital Transformation
Software Product Management and Business
Digital Systems and Service Development

Provided by
Lappeenranta-Lahti University of Technology - Finland

Version: 10 October 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]**
Tietotekniikan kandidaatin tutkinto-ohjelma	Bachelor's degree programme in Software Engineering	ASIIN, Euro-Inf® Label	ASIIN, 30.6.2017-30.9.2024	04
Bachelor's degree programme in Software and Systems Engineering, DD	Bachelor's degree programme in Software and Systems Engineering, DD	ASIIN, Euro-Inf® Label		04
Master's degree programme in Software Engineering and Digital Transformation	Master's degree programme in Software Engineering and Digital Transformation	ASIIN, Euro-Inf® Label	ASIIN, 30.6.2017-30.9.2024	04
Master's degree programme in Software Product Management and Business	Master's degree programme in Software Product Management and Business	ASIIN, Euro-Inf® Label		04
Master's degree programme in Digital Systems and Service Development	Master's degree programme in Digital Systems and Service Development	ASIIN, Euro-Inf® Label		04
Date of the contract: 21.03.2023 **Submission of the final version of the self-assessment report:** 21.02.2024 **Date of the onsite visit:** 09.04.2024 **at:** Lappeenranta Campus				
Expert panel:				

[1] ASIIN Seal for degree programmes; Euro-Inf®: Label European Label for Informatics

[2] TC: Technical Committee for the following subject areas: TC 04 - Informatics/Computer Science.

Prof. Dr. Bettina Harriehausen-Mühlbauer, Darmstadt University of Applied Sciences Prof. Dr. Peter Braun, TH Würzburg-Schweinfurt Prof. Dr. Georg Schneider, Trier University of Applied Sciences Dr. Stephan Flake, S&N CQM GmbH Arash Nedaei, Student representative, Oulu University	
Representative of the ASIIN headquarter: David Witt	
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 of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018	

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 Software Engineering	Bachelor of Science (Technology)	Software Engineering	6	Full-time	N/A	6 semesters	180 ETCS	2008
Bachelor's degree programme in Software and Systems Engineering, DD	Bachelor of Science (Technology)	Software Engineering, Systems Engineering	6	Full-time	Hebei University of Technology (HEBUT)	6 semesters	180 ETCS	2021
Master's degree programme in Software Engineering and Digital Transformation	Master of Science (Technology)	Software Engineering, Digital Transformation	7	Full-time	N/A	4 semesters	120 ETCS	2008
Master's degree programme in Software Product Management and Business	Master of Science (Technology)	Software Product Management and Business	7	Full-time	N/A	4 semesters	120 ETCS	2020
Master's degree programme in Digital Systems and Service Development	Master of Science (Technology)	Digital Systems and Service Development	7	Full-time	N/A	4 semesters	120 ETCS	2023

Lappeenranta-Lahti University of Technology (LUT) is a public university serving the two eponymous towns in South Eastern Finland. Lappeenranta campus, where LUT was founded in 1969, has more than 6,500 students enrolled, and at Lahti campus, which was opened in 2019, there are about 1,000 students. The two campuses are about 130 km apart. The university has, according to its strategy 'Trailblazers 2030', put the focus on sustainability, trying to put into focus issues such as carbon-neutrality, combating climate change, and usage of emissions in their teaching and research. The five degree programmes

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

under review here, too, include sustainability in their programme learning outcomes and the contents, thus tying neatly with the general university's mission and vision.

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

"BSc programme in Software Engineering, focuses on software development. It has been developed based on the Software Engineering Body of Knowledge and IEEE/ACM Computing Curricula. The programme is built on software engineering principles to provide students with a solid and broad basis in the discipline. It enables students to continue to pursue their interests in MSc programmes in the field of software engineering, and in their preferred minor studies."

For the Bachelor's degree programme Software and Systems Engineering (Double Degree) the institution has presented the following profile in the self-assessment report:

"In the double-degree BSc programme in Software and Systems Engineering the principles of the programme design are similar to the BSc programme in Software Engineering. The programme is based on the fundamentals of software engineering, with an emphasis on artificial intelligence and smart systems. The programme is provided in co-operation with Hebei University of technology (HEBUT) from China according to the co-operation agreement."

For the Master's degree programme Software Engineering and Digital Transformation the institution has presented the following profile in the self-assessment report:

„[T]he MSc programme in Software Engineering and Digital Transformation students can select out of the two specializations, either focusing on the software engineering track which emphasizes software development, software architecture, software quality assurance and software maintenance, or digital transformation, which emphasizes design for digitalization, value creation, business platforms and the digital economy."

For the Master's degree programme Software Product Management and Business the institution has presented the following profile in the self-assessment report:

"In the MSc programme in Software Product Management and Business the software-intensive products and services are major topics along with the process and software organization management, and the business aspects of the digitalization of services and fully digital products."

For the Master's degree programme Digital Systems and Service Development the institution has presented the following profile in the self-assessment report:

„In the MSc programme in Digital Systems and Service Development software design and development towards developing better human-centered digital services are in the focus, along with the maintainability and quality aspects of the digital services in general.”

C Expert 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:

- University strategy
- Degree certificates
- Degree regulations
- Learning outcome analysis
- Cooperation agreement between LUT and HEBUT
- University website
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The experts base their assessment of the learning outcomes on the information provided in the module descriptions, on the university's website, in the diploma supplements and in the Self-Assessment Report of all five degree programmes under review. For all programmes, LUT has described Educational Objectives and Intended Learning Outcomes (ILOs), which are published on the programmes' websites. By means of being published on the websites of the degree programmes, Intended Learning Outcomes are easily accessible for students as well as other stakeholders. Furthermore, there are regular revision processes in place that take into account feedback by external and internal stakeholders.

The experts refer to the Subject-Specific Criteria (SSC) of the Technical Committee Informatics/Computer Science, and the module descriptions as a basis for judging whether the

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

intended learning outcomes of the five degree programme as defined by LUT correspond with the competences as outlined by the SSC.

The experts note that the ILOs have been established in a comprehensible and logical manner. The development of ILOs of the study programmes involves both internal and external stakeholders so that the curricula can be adapted and modified according to the needs of the industry and the graduates on a regular basis. For example, LUT regularly conducts surveys, through which the different stakeholders get the chance to assess the programmes and their main objectives and adapt them if necessary. Internal stakeholders include all of LUT members (students, teaching staff, and non-academic employees), while the external stakeholders include the industry, alumni, the government, and society.

LUT defines the following overarching educational objectives for Bachelor's degree programmes:

- "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,
- extensive, advanced knowledge of their field and the capacity for understanding and critically assessing theories, key concepts, methods and principles,
- the capacity for scientific thinking and scientific approaches to work, taking ethical viewpoints into account,
- the ability to apply what they have learnt to their work and international collaboration,
- the ability to complete Master's level studies and for continuous learning,
- good communication and language skills and the ability to head activities and projects."

LUT defines the following overarching educational objectives for Master's degree programmes:

- "a good command of their core and advanced specialisation studies and the basics of their minor studies,
- a good command of extensive and highly specialised concepts, methods and knowledge of their field,
- the ability to apply scientific knowledge creatively, solve problems, develop new solutions, and examine phenomena critically, taking ethical viewpoints into consideration,
- the ability to operate independently as an expert and developer and/or entrepreneur in their field, also in an international working environment,
- the ability to go on to complete scientific postgraduate studies and develop their skills continuously,

- excellent interaction, communication, language, teamwork and project work skills and be able to manage issues and/or lead people."

For the Bachelor's degree programme Software Engineering, LUT defines the following intended learning outcomes:

"After completing the Bachelor's programme in Software Engineering the students

1. Can develop complex and scaling software by applying the principles of software engineering theory, tools and processes, as well as computer science and mathematics theories and methods.
2. Has demonstrated the understanding of software engineering principles and professional skills and can select the appropriate solution methods for the problem at hand.
3. Understands the main principles of teamwork dynamics and can participate to software projects in heterogenous teams.
4. Can work professionally with colleagues and clients and can solve problems that can arise in multicultural or multilingual environments in software engineering and information technology contexts.
5. Communicates fluently in both writing and orally as part of teamwork. Communication and document production can be performed in both Finnish and English.
6. Has understood the importance of life-long learning for careers and is always ready to learn something new.
7. Can describe a problem, and design and create a solution for it by applying software engineering technologies and practises.
8. Can apply technical skills learned during studies to different environments, and consider the environments' technical, social, and economic limitations.
9. Find out, analyse, and define project stakeholders' requirements.
10. Take into account ethical and professional practises when building software-based solutions.
11. Understand IT-related business, entrepreneurship, and innovation models."

For the Bachelor's degree programme Software and Systems Engineering (Double Degree), LUT defines the following intended learning outcomes:

"The intended learning outcomes are the same for both Bachelor's programmes. After completing the Bachelor's programme in Software and Systems Engineering (DD) the graduates are able to

1. apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to development of complex, scalable software systems,
2. demonstrate software engineering application domain knowledge and principles of selecting and the use of software methods,
3. understand the dynamics of how teams develop and function, productively participate in software projects with heterogeneous teams,
4. interact professionally with colleagues or clients and overcome challenges that arise from geographic distance, cultural differences, and multiple languages in the context of computing and software engineering,
5. communicate effectively both verbally and in writing, produce documents, and work as a part of a project team using English,
6. recognize the need for, and engage in, lifelong learning,
7. describe, design and solve problems by programming and using software engineering techniques and experimentation,
8. apply technical skills in different application domains taking into account technical, social, an economical constraints,
9. elicit, analyze and specify software requirements through a productive working relationship with project stakeholders,
10. apply appropriate codes of ethics and professional conduct to the solution of software engineering problems and
11. understand IT related business, entrepreneurship and innovation models."

For the Master's degree programme Software Engineering and Digital Transformation, LUT defines the following intended learning outcomes:

"After completing the Master's programme in Software Engineering and Digital Transformation graduates are able to

1. Describe and adapt computer science, software engineering knowledge, best practices, and standards appropriate to engineering complex software systems.
2. Analyze a problem; identify and elicit functional, non-functional and sustainability requirements appropriate to its solution.
3. Demonstrate the empiricism and familiarity with the methods of academic research and writing.
4. Design, evaluate, and adapt software processes and software development tools to meet the needs of an advanced development project.
5. Elicit user needs and design an effective software solution.
6. Logical, convincing, and effective communication both orally and in writing.

7. Function effectively in teams and adapt teaming strategies to improve the productivity.
8. Recognize human, security, social, entrepreneur issues and responsibilities relevant to engineering software and digitalization of services.
9. Integrate into a multi-cultural working environment with practical orientation and collaborating in professional networks.
10. Acknowledge life-long learning as a way to stay up to date in the profession.

In addition, the students taken Software Engineering specialisation are able to

11. Design software systems and define architectures in open and distributed environments in holistic and integrative manner
12. Apply software engineering best practices and standards for software development and evolution of diverse types of software systems.

In addition, the students taken Digital Transformation specialization are able to

13. Analyze and develop digital business models and value creation practices through re-engineering of processes and services
14. Evaluate business impact and cost benefits of digitalisation on individuals, organizations, society and global context and design supporting digital platforms."

For the Master's degree programme Software Product Management and Business, LUT defines the following intended learning outcomes:

"After completing the Master's programme in Software Product Management and Business the graduates are able to

1. Analyse a problem; identify and elicit functional and non-functional requirement.
2. Design and evaluate a business case and its impacts for a software-intensive product or a service.
3. Adapt software engineering and product management knowledge, best practices, and standards.
4. Design, evaluate, and adapt software processes and software development tools to meet the needs of a development project.
5. Analyse, develop and manage new software-based digital products in the software industry.
6. Communicate logically, convincingly, and effectively both orally and in writing.
7. Function effectively in teams and adapt teaming strategies to improve the productivity.

8. Recognize human, security, social, entrepreneur issues and responsibilities relevant to engineering software and digitalization of services.
9. Integrate into a multi-cultural working environment with practical orientation and collaborating in professional networks.
10. Demonstrate the empiricism and familiarity with the methods of academic research and writing.
11. Acknowledge life-long learning as a way to stay up to date in the profession."

For the Master's degree programme Digital Systems and Service Development, LUT defines the following intended learning outcomes:

"After completing the Master's programme in Digital Systems and Service Development the graduates are able to

1. Become an expert in the development of human-centred digital services that incorporate state-of-the-art digital technologies.
2. Learn to analyse a problem, identify and elicit human-centred needs and values for digital services.
3. Design, develop and evaluate data-driven and connected software-intensive smart services.
4. Apply, evaluate, and adapt software processes and software development tools to meet the needs of human-driven digital services.
5. Analyse, develop and manage new software-based digital services in the industry."

In the experts' opinion, the intended learning outcomes of all five degree programmes are clear, plausible and allow students to take up an occupation, which corresponds to their qualification. They learn that the graduates of LUT are much sought after in the labor market. The representatives of industry emphasize the high quality of the graduates of all programmes under review and students as well as graduates are satisfied with and well aware of their good job perspectives.

During the on-site visit, the experts are presented with written examinations and final theses to verify the achievement of the learning objectives and the intended learning outcomes, which they consider to correspond to EQF-6 for the Bachelor's degree programmes and EQF-7 for the Master's degree programmes.

In summary, the experts confirm that both Bachelor's degree programmes under review adequately reflect level 6 of the European Qualification Framework (EQF) and the Master's degree programmes adequately reflect EQF-7. The programme learning outcomes of all

programmes are consistent with the respective ASIIN Subject-Specific Criteria of the Technical Committee of Informatics/Computer Science. They aim at the acquisition of specific competences and are well-anchored, binding and easily accessible to all stakeholders.

Criterion 1.2 Name of the Degree Programme

Evidence:

- Self-Assessment Report
- Diploma Supplements
- Discussions during the audit

Preliminary assessment and analysis of the experts:
The experts confirm that the English translation (Bachelor's programme in Software Engineering) and the original Finnish name (Tietotekniikan kandidaatin tutkinto-ohjelma) of the Bachelor's degree programme Software Engineering as well as the English names of the other four degree programmes under review correspond with the intended aims and learning outcomes as well as the main course language of each programme.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Study plan of the degree programmes
- Module descriptions
- Objective-module matrices
- Discussions during the audit

Preliminary assessment and analysis of the experts:
The curricula of the five study programmes are reviewed by the experts in order to identify whether the described programme objectives and learning outcomes can be achieved by the available modules. Course descriptions as well as overviews and competence-subject matrices matching the general learning objectives and the module contents were provided for a thorough analysis. In the Self-Assessment Report, the university gives a detailed overview of how the competences acquired with the curricula presented correspond to the learning outcomes of Subject-Specific-Criteria of The Technical Committee 04 – Informatics/Computer Science (SSC 04). The curricula of the five degree programmes are designed to comply with the programme objectives and learning outcomes and they are subject to constant revision processes. As such, the curricula are reviewed regularly and commented on by students and teachers as well as by external stakeholders such as alumni or partners

from government and the private sector. Regular changes are made to ensure that the curricula are up to modern standards

For both Bachelor's degree programmes, the curriculum is structured for six semesters and 180 ECTS need to be achieved by the students. For the three Master's degree programmes, the curriculum is structured for four semesters and 120 ECTS need to be achieved by the students. Furthermore, in its Self-assessment report, LUT states "[a]t LUT, the Bachelor's and Master's degrees in technology may include an internship worth no more than 12 ECTS credits in total and degree programme specific requirements are set for internships. Work internships are part of the curricula as an Internship course with course descriptions. Internship instructions are also available on the eLUT study portal. Programme specific details concerning internships and other structural details are described in the programmes' curricula available on the eLUT study portal. Beginning from the academic year 2024-25 the internship courses of all LUT programmes will be offered in a new name 'Work experience' which better reflects the content and procedure of the course."

The Bachelor's degree programme Software Engineering is conducted in Finnish. It consists of at least 55 ECTS-credits in so called "General studies" (e.g. Introduction to Programming, Software Project Management, Basics of Statistics, Engineering ethics, Language and communication studies), at least 88 ECTS-credits in so called "Intermediate specialisation studies" covering Computer Science and Software Engineering topics (e.g. Foundations of Computer Science, Introduction to Web Programming, Object-Oriented Programming, Principles of C-Programming, Distributed Systems, Fundamentals of Software Testing, Data Structures and Algorithms), and at least 20 ECTS-credits in so called "Minor studies". "Minor studies" include modules from the fields of Industrial engineering and management, Electronics, and Business Administration. At the end, students have to write a Bachelor Thesis.

The expert group is very convinced of the structuring of the submitted curriculum and the corresponding content level of the Bachelor's degree programme in Software Engineering. This is also matched by the research activities of the professors and students, which also find influence in the individual modules. The experts are of the opinion that the curriculum is adequately structured to achieve the intended learning objectives. Furthermore, they can confirm that regular revisions and adjustments are made to adapt the curriculum to the latest developments in science and industry requirements. All relevant stakeholders are involved in this process.

The Bachelor's degree programme Software and Systems Engineering is conducted in English and is offered as a Double Degree programme in cooperation with the Hebei University of Technology (HEBUT) in China. Graduates will receive degrees from LUT as well as HEBUT. The curriculum consists of "common obligatory general studies of 44 ECTS,

include introductory course as well as courses in engineering physics, C programming, mathematics, technical documentation and 3D modelling, statistical mathematics, introduction to IoT-based systems. Language and communication studies of 10-19 ECTS in Chinese, Finnish and English. Intermediate specialisation studies of 83 ECTS of object-oriented programming, computer science, user interfaces and usability, discrete models and methods, data structures and algorithms, web applications, computer networks and Internet, cybersecurity of software systems. The specialisation studies include a Bachelor's thesis and seminar totalling 12 ECTS." A minimum of 20 ECTS in so called Minor studies "in energy economics; sustainability science; practical engineering, innovation and entrepreneurship; and Chinese business, culture and technology." LUT and HEBUT concluded a cooperation agreement that defines the details of the programme. It stipulates that all modules are carried out at the campuses in Laapeenranta and Lahti, so there are no modules or semesters that must be completed at the HEBUT campus, meaning that students on this programme do not necessarily have to go to China as part of their studies. Moreover, the cooperation agreement defines that "[t]he number of courses taught by HEBUT shall be 50% and by LUT 50% if not otherwise agreed between the Parties."

In principle, the experts welcome the approach of a double degree programme. However, they are of the opinion that this degree programme does not meet the requirements of a double degree programme, particularly with regard to the cooperation agreement. The agreement states that each of the two universities should be responsible for 50% of the teaching. However, this is not recognisable after reviewing the documents and after the discussions on site. The experts can accept that the students do not have to go to China as part of their degree programme, but that there is a HEBUT campus under the roof of the LUT premises. However, the programme is currently mainly supported by LUT and HEBUT does not meet the obligations to recognise a double degree programme. The experts learnt that almost all technical courses are mainly taught by LUT lecturers and that there is a high degree of discontent among the LUT teaching staff reg. this fact. For example, HEBUT is currently mostly only 100% responsible for courses with a reference to China, such as "Development of High-Tech Enterprises in China", "Traditional Chinese Culture", or Chinese language courses, but hardly for any of the technical courses. For the other modules, LUT is either fully responsible or is largely responsible and HEBUT only provides teaching assistants. There is also the opportunity to take part in a summer school in China, which is organised by HEBUT but is not compulsory. From the experts' point of view, this is not sufficient to establish a double degree programme, as such a degree raises expectations among students and also industry that cannot be fulfilled here. Although the students state that they are generally pleased with the programme and greatly appreciate courses such as 'Chinese Culture', they also note that the majority of technical subjects are only offered by LUT.

Following the audit, LUT and HEBUT state the following: “For the future development of the DD programme, LUT has proposed to HEBUT that four computer science courses in the programme could be provided by HEBUT School of AI, Computer science degree programme. LUT would have a supporting role on those courses. This change is justified from the core competence perspective, as LUT’s focus is on software engineering and HEBUT has better competence in computer science. In practice, this means that the responsibility for the selected courses (course delivery, assessment and quality assurance) would be transferred from LUT to HEBUT. In the following academic year (2024-25), the current division of labour would still be maintained, but in 2025-26 one or two courses would be provided by HEBUT and in 2026-27 the remaining 2-3 courses would follow. HEBUT has accepted this idea, and we will discuss together in more detail what the role change would mean in practice and how it would be implemented. Potential courses to be transferred would be: Foundations of Computer Science, Data Structures and Algorithms, Foundations of Information Processing, Foundations of Artificial Intelligence and Machine Learning.” The experts appreciated this quick statement, assess the proposed adjustments positively in principle, and recognise that this would be a good further development in order to distribute responsibility for the entire degree programme more equally between the two institutions. However, as these changes have not yet come into force and, as described, HEBUT is currently only responsible for a small part of the curriculum, the experts come to the conclusion that, in their opinion, the programme cannot be accredited as a double degree in this form. They are therefore in favour of the requirement that the proportion of the curriculum for which HEBUT is responsible must be increased in order to correspond to the character of a double degree and also to fulfil the mutual cooperation agreement.

According to the Degree Regulations all three Master’s degree programmes consist of

1. “core studies, 0–47 ECTS credits,
2. advanced specialisation studies, 50–95 ECTS credits,
3. minor studies, 20–24/0 ECTS credits,
4. elective studies, 0–30 ECTS credits,
5. language and communication studies, 0–10 ECTS credits.

Advanced specialisation studies include a Master’s thesis worth 30 ECTS credits.”

In all three Master’s degrees, the following courses are part of the core studies: “User Experience Design”, “Software Engineering Models and Modeling”, “Requirement

Engineering", and "Research and Design Methods". In the advanced specialisation studies, students then specialise in the respective degree programmes.

In the Master's degree programme Software Engineering and Digital Transformation, students have the option to specialise in the field of Software Engineering or Digital Transformation. They have to reach at least 60 ECTS-credits in one of those fields including their Master's Thesis consisting of 30 ECTS-credits. Furthermore, students have to gain at least 24 ECTS-credits in the so-called minor studies. There, they can choose between modules in the fields of Industrial Engineering and Management, Embedded Systems and Communications, International Business and Management, or Basic Business Studies.

In the Master's degree programme Product Management and Business, students must complete at least 78 ECTS from the advanced specialisation studies. This includes the following compulsory subjects: Software and Application Innovation, Foundations of Software Product Management, Software Process Management, Product Analytics, Software Business, as well as the Master's Thesis and other elective modules such as Sustainability and IT, Foundations of Digital Transformation, Business Strategy in Digital Economy, and Digital Business Platforms.

In the Master's degree programme Digital Systems and Service Development, students must complete at least 78 ECTS from the advanced specialisation studies. This includes the following compulsory subjects: Software and system architectures, Service Design, Intelligent Systems and Services, Cloud Services and Infrastructure, and Full Stack Development, as well as the Master's Thesis and other elective modules such as Game Development Project, Distributed Systems, Data-Intensive Systems, and Software Maintenance.

The expert group is very convinced of the structuring of the submitted curricula and the corresponding content level of the three Master's degree programmes. This is also matched by the research activities of the professors and students, which also find influence in the individual modules. They are of the opinion that the curricula are adequately structured to achieve the intended learning objectives. Furthermore, they can confirm that regular revisions and adjustments are made to adapt the curriculum to the latest developments in science and industry requirements. All relevant stakeholders are involved in this process.

Overall, the experts note during the audit that a large number of students are already working alongside their studies, which can sometimes extend study times or mean that mobility opportunities are only partially utilized (see below). To address this, the experts discuss the

possibility of offering all degree programmes as part-time options with the programme coordinators. In this case, special study pathways could be offered that could be completed in a longer standard period of study. As a large number of students are already studying part-time technically and are not always able to achieve the 30 ECTS per semester, the experts believe that this would be an appropriate adaptation of LUT's programmes. This could then also have a positive impact on student statistics. The programme managers are open to the proposal. For these reasons, the experts recommend also offering part time programmes.

Mobility

In its Self-assessment report, LUT describes its international orientation and mobility offers as follows: “Many programmes are taught in English to serve people from foreign countries. LUT is a university with a strong international orientation, in 2022 there were students from 87 different countries and about 30 % of new students came from outside Finland. LUT promotes international student mobility by offering many paths to go abroad during studies. In particular, in the double degree BSc programme in Software and Systems Engineering (DD) there are good opportunities for students to study in China and develop their understanding of enterprises and industry in Asia. In recent years, internationalisation and student mobility has been actively strengthened by building double and triple master’s programmes with prioritized university partners. Currently there are two master’s programmes available for BSc graduates: a Nordic Master’s Programme in Sustainable ICT Solutions for Tomorrow (Prophet) and Erasmus Mundus Master’s programme Software Engineers for Green Deal provided together with University of L'Aquila in Italy (UnivAq) and Vrije Universiteit Amsterdam in the Netherlands (VUA), LUT being the coordinating institution of the programme.

Future developments in student mobility and double degree agreements are currently being formulated with the intention of forming a pool of partnerships with 5-6 universities (existing agreements included). The current expansion agenda is to offer a wider range of double degree partnerships within EU and to establish more partnerships in Asia and Oceania. The degree structures make exchange studies possible and student services offer support and advice for students interested in exchange studies in a foreign university. The study counsellor nominated to serve students of a specific programme in their study planning and Study Service’s mobility services give advice and help students in every phase of the international exchange. Information for students is available on the eLUT study portal. However, statistics on student mobility in the programmes show that only a small number of students choose to take exchange studies abroad. Fortunately, there are more students arriving from abroad, enabling LUT students to internationalise at home.”

The experts recognise that the university offers a wide range of mobility opportunities and provides students with adequate support. Moreover, all curricula are designed in such a way that study periods abroad can be easily integrated. In addition, the university has adequate regulations for recognising external achievements. However, as the university itself describes, the number of outgoing students is relatively low. During the audit discussions, the experts find out that this is partly due to the fact that many students are already working part-time and therefore do not want to spend time abroad and partly due to the relatively high number of international students for whom studying at LUT is already a stay abroad. The students themselves do not see any systematic problems on the part of LUT that would make a stay abroad difficult. The students state that it is very easy to go abroad if they are interested and that they receive good support from the university. It is also easy to have external achievements recognised. The experts therefore come to the conclusion that LUT provides adequate conditions to enable international mobility for students.

Criterion 1.4 Admission Requirements

Evidence:

- Self-Assessment Report
- Academic Guidelines
- Admission Guide
- Websites
- Discussions during the audit

Preliminary assessment and analysis of the experts:

At LUT, the university body decides annually on the intake of students. Specific requirements are proposed by the deans of each school and need approval by the vice rector for education. Information about programmes and their admission criteria are published on the national service “Opintopolku” which is maintained by the Finnish National Agency for Education. The admission criteria for international programmes is published on the sister website of “Studyinfo”. These webpages are also used by the students to submit applications.

Admission procedures for BSc programmes:

In its Self-assessment report, LUT describes the admission procedure and regulations for BSc programmes as follows:

“The admission to a Bachelor´s degree conducted in Finnish language is organised mainly through a joint admission system called DIA (a joint admission to Studies of Bachelor and Master of Science in Technology). DIA-admission is used by all Finnish universities offering

Bachelor degrees in technology. The applicant is able to apply for up to six different study programmes in technology in one or several universities. All programmes have similar admission criteria and entrance exams, which are based on the upper secondary school curriculum in mathematics, physics, and chemistry. The applicant must place the programmes in order of preference on the application form." For programmes conducted in Finnish as the Bachelor's degree programme in Software Engineering, "Applicants can be selected in two different quotas: 1) Points from the National Matriculation Examination grades 2) points from entrance exams. To be selected directly based on the points from the Matriculation Exam grades the applicant must have obtained either a minimum grade C from physics (or chemistry) exam and passed an advanced course in mathematics or have a minimum grade C in an advanced level exam in mathematics. The applicant's five best grades in the Matriculation Examination Certificate give points for the selection. Applicants not eligible for the admission based on the points from the Matriculation Exam must take the entrance exams. The entrance exams are based on the Finnish upper secondary school curriculum in mathematics, physics, and chemistry." For programmes conducted in English as the Double Degree programme under review, admissions are organized "through two separate admissions: second admission system and rolling admissions. The second admission system is used by all Finnish universities that offer BSc degree programmes. The admission criteria are the same as in joint admission DIA, but the system has two selection groups: 1. Finnish Matriculation Examination (FME) and equivalent European Baccalaureate (EB), International Baccalaureate (IB), Reifebrüfung (RB) and Deutsches Internationales Abitur (DIA) and 2. other upper secondary degrees and SAT test results. Applicants in the first selection group of FME, EB, IB, RB, DIA are considered as applicants with Finnish qualifications as they all nationally considered as comparable upper secondary degrees. LUT University has separated the applicants of two selection groups into two separate admissions and uses second admission system only for the applicants with Finnish qualifications. All applicants with other upper secondary degrees or so called non-Finnish qualifications apply in the rolling admission to LUT. […] In rolling admission system, applicants can apply in two different quotas a) certificate-based admission and b) upper secondary degree and SAT score."

<u>Admission procedure for HEBUT-students in the Double Degree programme:</u>

"Students from Hebei University of Technology (HEBUT) starting in LUT's BSc programme in Software and Systems Engineering (DD) are selected and admitted according to the procedures and eligibility criteria of HEBUT as expressed in the co-operation agreement of HEBUT and LUT. In all international joint programmes (such as HEBUT-DD programmes) that are conducted with a partner university, admission is processed in the LUT mobility services

electronic application system, where students submit their personal information into a registration form. The programme management assures that the language criteria as well as other minimum criteria are equal to other students in the programme."

Admission to the Master's degree programmes:

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

- 55 students per year into the MSc programme in Software Engineering and Digital Transformation
- 50 students per year into the MSc programme in Digital Systems and Service Development
- 50 students per year into the MSc programme in Software Product Management and Business.

Internal students: In this intake channel, applicants come from within the School. As according to the Finnish university law, when admitted to a bachelor's programme, students are granted 3+2 years of study right: 3 years for Bachelor's degree + 2 years for Master's degree. Students can select the same specialization area they have taken in their Bachelor's studies for their Master's level specialisation option. It is also possible to apply for transfer to another specialisation option or Master's programme. In that case, additional studies may be required, case-by-case, to meet the expected competence profile.

External Applicants: The applications are submitted via Studyinfo – an electronic application system operated by the Finnish National Agency for Education (Opetushallitus). The admission decision is made based on the required documentation, evaluation of the applicant's previous studies and a possible interviews. The admission is organized in two separate admission systems, regular admission and rolling admission. […]

Eligibility: To be considered for admission to the programme, the applicant must fulfil the following criteria:

(1) Degree must give eligibility to apply to university level Master's studies in the country where the degree was completed in

(2) Degrees completed in Finland: Bachelor of Science in Technology completed in a University, Bachelor of Engineering completed in University of Applied Sciences, Bachelor of Business Administration, Business Information Technology completed in a University of Applied Sciences.

(3) Degrees completed outside Finland: Bachelor of Science in Technology OR closely related to Technology completed, Bachelor of Science in Business Informatics completed in a University, Bachelor of Engineering in Software Engineering or in Computer Science or in Information Technology completed in University of Applied Sciences, Bachelor of Engineering completed in University of Applied Sciences

(4) All applicants must demonstrate a minimum of 24 ECTS credits of programme-specific studies Software Engineering, Computer Science, Information Technology, Information Systems, Business Informatics, Computer Science and Engineering, Business Systems and Analytics, Business Systems Design, Programming, Databases or Data Science."

In their assessment, the experts find the admission for all degree programmes under review rules to be binding, transparent, and based on LUT's written regulations as well as state regulations. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

Criterion 1.5 Workload and Credits

Evidence:

- Module descriptions
- Degree regulation
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

All programmes at LUT follow the ECTS system. According to the degree regulation one ECTS is stipulated to equal 27 hours of work, be it teaching hours, individual study, as well as examinations and preparations thereof. 60 ECTS are expected to be acquired in one academic year, which, according to the programme coordinators as well as the students, is manageable. The academic year is divided into periods of seven weeks that terminate with an examination week. One semester consists of two periods. Generally, a course can span up to four periods. The module descriptions can be found online for all study programmes

under review. In the module descriptions, students can find the total workload of each course.

For the two Bachelor's degree programmes the total amount of ECTS to acquire amounts to 180; the three Master's degree programmes each amount to 120 ECTS in total. During discussions with the students, the experts found that students are satisfied with the workload, which is transparent to them and does not present any insurmountable obstacles.

The workload and crediting of all study programmes is regularly monitored and analysed. Changes to the programme are made when it becomes evident during analysis that students are struggling. The experts find the monitoring to be proactive and satisfactory. Overall, the credit system appears to the experts to be well-structured across all programmes, with appropriate weightings given to the various modules.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Module descriptions
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:
According to its Self-assessment report, "[w]hen designing a course, teachers first define the content, ILOs and student workload in ECTS credits and then accordingly plan suitable teaching methods, hours needed for contact teaching and independent study, learning activities and assessment methods. Most courses apply a variety of learning activities, such as traditional or flipped classroom lectures, exercises, learning assignments, project work, and learning tests or quizzes, with few courses offered in a fully online mode with an assisted self-study approach. Learning activities applied in courses are recorded and reviewed as part of the curriculum work to manage the variety of teaching and assessment methods as needed […]. The review made by heads of programmes […] indicates that there is increasing variation in teaching and assessment methods used on courses. In general, lecture-based instruction is used in most courses but increasingly other teaching methods that activate students' learning are used alongside with it. At the same time, the role of traditional exams as student assessment methods is decreasing and largely replaced by weekly exercises and home assignments, learning tests and quizzes, project works and written reports. […] The most common methods of teaching are lectures and exercises in their different forms. They are in use almost in all compulsory courses of the programmes, but plenty of other methods, such as discussions, tutorials, project work, peer evaluation, group work and simulations have become increasingly popular. The same development can be seen in

the assessment methods. There are more and more courses where learning outcomes are evaluated by assignments, presentations, projects, peer evaluation, learning diaries, portfolios and online tests and quizzes rather than traditional written exams."

In summary, the experts can confirm that a variety of learning methods are used and that they are aligned with the intended learning outcomes. In the discussions with students, the experts learn that they are generally satisfied with the quality of teaching and learning in the programmes under review. Gathering systematic feedback on the quality of teaching and learning can be achieved through the course evaluation survey conducted at the end of each semester, which serves as a valuable source of information.

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

Criterion 1.3 Curriculum:

In its statement, LUT explains that they have "suggested to HEBUT that computer science courses in the programme could be provided by HEBUT School of AI, Computer science degree programme. LUT would still have a supporting role on those courses due to course management reasons. This change is justified in terms of competence profiles of both partners, as LUT's focus is more on software engineering and HEBUT focuses on computer science. The negotiations on cooperation agreement renewal between LUT and HEBUT are currently ongoing, and the peers' feedback will be taken into account. It supports LUT's intention to balance responsibilities of institutions in providing the BSc DD Software and Systems Engineering programme. LUT's aim to balance the responsibilities applies also to other DD-programmes accredited by ASIIN: BSc DD Mechanical Engineering and BSc DD Energy Technology."

The experts thank the LUT for its statement and support the approach outlined. However, they remain with the proposed requirement regarding the double degree for the time being until corresponding regulations are put into force.

The experts are grateful for the statement regarding part time studies and recognise that LUT must follow national regulations and is already taking measures to enable students to study while working. The experts merely wanted to recommend that, in addition to the existing full-time programmes with a standard period of study of three (Bachelor) or two (Master) years, the programmes could also be offered in a variant that provides for a longer standard period of study from the beginning. This could improve the study statistics and

bring them into line with the actual situation. The experts support the fact that LUT offers an optional timing template for courses for working students.

The experts consider criterion 1 not to be fulfilled.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, Concept and Organisation

Evidence:

- Module descriptions
- Degree regulations
- Exemplary examinations
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, student assessment at LUT "is done using various methods, from traditional written exams to continuous assessment or as a combination of various methods. It is up to the teacher responsible for the course to design the most appropriate assessment method following the principle that different assessment methods serve to achieve different intended learning outcomes." Evaluation methods are aligned with learning methods and course outcomes to ensure graduates develop integrated competencies. "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 is required to pass the course."

Assessment methods vary within the various programmes, even though written exams are the most common. In its Self-assessment report, LUT describes "[i]n the BSc programmes the most typical assessment means in addition to exams are exercises, code evaluations, home assignments, learning tests and quizzes, project work, capstone projects and written reports. In MSc programmes, more independent study and demonstration of knowledge, skills and competences are required, thus project works, group work, written reports, presentations and seminar works are most commonly used assessment methods. In the

degree programmes, a common evaluation method is the written examination at the end of the course. Almost 40 % of courses in BSc programmes and about 50% of courses in MSc programmes utilize continuous evaluation methods to support student learning, by for example, exercises, learning tests, or weekly homework. Examples of BSc courses utilizing continuous assessment are Introduction to Web Programming, Distributed Systems, and Computer Networks and Internet. Corresponding examples of MSc programmes are Requirements Engineering and Software Engineering Models and Modeling courses. It is an aim to utilize various assessment methods, both continuous assessment and exams at the end of the courses in order not to overburden the students and provide varied means to develop their competences."

Examination dates and any changes are communicated through the respective programme websites and the digital academic portal eLUT, ensuring up-to-date information for students. "There are altogether seven examination weeks during the academic year 2023-24, plus an additional exam week for retakes in summer."

LUT has policies in place for students who miss examinations due to illness, emergencies, or official university activities. The university also facilitates examinations for students with disabilities.

The experts note that the examination system at LUT is well-structured and transparent. The assessment methods align with intended learning outcomes, and the workload appears to be appropriately distributed. The university's policies for academic misconduct, including plagiarism, are clearly defined. Overall, the examination and assessment processes at LUT seem to support the academic goals of the programmes while maintaining fairness and accountability.

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

The experts consider criterion 2 to be fulfilled.

3. Resources

Criterion 3.1 Staff and Staff Development

Evidence:

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

Preliminary assessment and analysis of the experts:

In its Self-assessment report, LUT states "[t]he school has about 400 full-time employees. The department of Software Engineering employs 83 academic staff members and is responsible for providing the programmes [under review]. In addition, there are personnel from Hebei University of Technology contributing to the double-degree BSc programme in Software and Systems Engineering mainly on mathematics, introductory programming, fundamentals of computer science, and in the Chinese language courses. The department of Software Engineering also cooperates a lot with the departments of Computational Science and Industrial Engineering and Management, which offer some of the courses used in the implementation of Software Engineering programmes. The composition of teaching and research personnel at LUT is based on LUT's researcher career system. In the four-level tenure track system of LUT, researchers and teachers are employed either in a tenure track position or a non-tenure track position. The target of the tenure track positions is to advance to the level of full professor based on post-doctoral achievements and qualifications. Non-tenure track positions are either research or teaching oriented, based on the needs of the school. […] Teachers responsible for each course are either professors or doctors, and the doctoral students assist in teaching. In addition, teaching assistants are recruited to balance the workload of teachers. They are typically third year BSc students, MSc students who have graduated from a corresponding Bachelor's programme, or doctoral students funded by the department or the degree programmes."

The following table presents the composition of academic staff in department of Software Engineering:

Position type	Total number of positions / Software Engineering
Professors	5
Associate/Assistant Professors	10
Post-doctoral researchers	9
Doctoral Students	26
Total academic staff	50

Staff Development: In its Self-assessment report, LUT describes that it "regularly organizes training in university pedagogy for its personnel. The target of university pedagogy training is to develop and support LUT teaching and research staff's pedagogical and teaching skills. University pedagogy training also develops interaction skills and strengthens participants' teacher identity. The training consists of a ten-credit basic module and an optional module tray, from which participants can choose 15 credits worth of courses that best support their teaching development. Those who have completed 25 credits (10 credits for basic module and 15 credits for optional courses) will receive a certificate of teaching skills. It is possible to ask for a register type of document of single courses completed. From the 25-credit certificate, it is possible to recognize 4 credits for the optional courses in post-graduate studies. Until 2023, 14 staff members from department of Software Engineering have completed the whole of 25 credits. The costs of staff training organised by the university are covered by general personnel training appropriations. The school offers its staff members the opportunity to take part in staff training outside of the university to support their professional development and expertise. The university also supports the professional development of its personnel by allowing them to take two lessons (2 x 45 minutes) per week for independent study if the head of the unit considers that the studies serve the purposes of the working community. University staff members conduct annual performance and development discussions with their immediate supervisor, examining the results obtained and setting goals for the near future also concerning professional development and personnel training. By the performance and development discussions the supervisors can evaluate the training needs of the personnel and steer them to training and make plans for future recruitments accordingly."

During the audit, the experts want to know from the teaching staff how well the university supports them in going abroad or taking a sabbatical, for example, which reveals different experiences across the lecturers. Some faculty members share positive experiences and explain that last year, at least seven staff members went abroad for about six weeks, supported by a special university grant, which required an internal application process. Overall, the environment is described as very supportive of international projects. However, several faculty members expressed concerns about the current support for sabbaticals, primarily due to funding issues. While it is possible to go abroad, it heavily depends on the availability of external funding sources, such as Erasmus grants or industry sponsorships, as university funding is scarce. The teaching staff explains that this year, for the first time in a decade, the university is providing funds for full professors to take sabbaticals, but associate professors are not included in this arrangement. In summary, although faculty members can go abroad when external funding is available, the lack of internal financial support remains a significant challenge. Even if the experts can understand that resources are limited and

that only a limited number of lecturers can take advantage of a sabbatical or go abroad, they are in favour of these opportunities being given not only to full professors but to all kind of professors and teachers, as associate professors for example.

In summary, the experts conclude that the teaching staff's composition, scientific orientation and qualifications, as specified in the Staff Handbook, are suitable for successfully implementing and sustaining the five degree programmes under review. However, they recommend providing opportunities to enable all kind of professors and teachers to go abroad or on a sabbatical.

Criterion 3.2 Student Support and Student Services

Evidence:

- Website of the university
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The student services at LUT are supposed to help students throughout their study pathway by providing individual and group guidance on issues such as degree structure, study counselling, personal study plans and career advice. Students receive group counselling about the study programmes in a way that is integrated into specific stages of the curricula, as well as at the individual request of students when they need help. All LUT students start their studies with orientation days, which take place one week before the start of classes.

LUT career services is an offer for students to get information on potential career paths and help with the job search process. Offers include sharing job positions, organising trainings, webinars and workshops about job search and career planning, as well as organising low threshold Career Café discussion opportunities on campuses individually or in groups, networking and recruitment events and offering individual counselling and career guidance.

During the audit, the students describe the services at LUT as sufficient for their needs. The atmosphere at the university among the students and with the teachers appears familiar. The experts find the student services to be smooth and convenient for the students. However, the students note in the discussions that it is not always easy to find an internship. Although internships are no longer compulsory in the individual degree programmes, many students still see them as a beneficial experience. As many students throughout Finland are looking for internships or so-called ‘summer jobs’ for the same period over the summer, it is sometimes necessary to apply very early in order to get a place. This has been particularly surprising for some international students. In addition, it can sometimes be difficult for

these students if they do not have sufficient Finnish language skills, as these are still required by many companies. Although the students note that this is not the university's fault, they would still like a little more support in finding suitable internships. The experts are of the opinion that the university already provides a good network, for example through job fairs, which should help students in their job search. However, they also recognise that it is apparently sometimes difficult for students to find suitable internships in due time. Therefore, taking into account the students' comments, the experts recommend to more strongly supporting students in their search for an internship.

Criterion 3.3 Funds and equipment

Evidence:

- Self-assessment report
- Tour of the facilities
- Discussion during the audit

Preliminary assessment and analysis of the experts:
In its Self-assessment report, LUT sets out its financial and resource resources as follows: "The annual revenue of the school is about 31 million euros. Most of the money needed for providing degree education comes from university budget received from Finnish Ministry of Education and Culture. Approximately 39 % of the school's funding comes from external sources (12 million in 2021), including mainly research funding from the Academy of Finland, the Finnish Funding Agency for Technology and Innovation, the European Commission, and private companies. The annual revenue of the department of Software Engineering is around 7 million euro. It covers the all the degree education and research activities provided by the department. Approximately 45 % of the department's funding comes from external sources main funding sources being Business Finland, European Commission, Regional Councils and different foundations and Academy of Finland. The department of Software Engineering includes several laboratories with 15 professorships. The annual budget of each department of the school is thus based on two components: internal budget mainly for teaching activities and external funding for research activities. In addition, the university has an investment program to support investments for research and teaching equipment.

The staff participating in teaching activities includes professors, assistant and associate professors, post-doctoral researchers, and doctoral students. Professors and assistant/associate professors, who are normally in charge of the courses and the specialisation studies, are mostly paid from public budget funds. This guarantees a solid foundation for and the continuity of the degree programme. Part of the funding for post-doctoral researchers

comes from external funding (there are significant individual variations; the external funding varies from 0 to 100%, and it may cover e.g. 30% of the person's total labour cost). The funding for doctoral students comes chiefly from research projects and from the LUT Doctoral School. Basic teaching and teaching materials, excursions, maintenance of the teaching equipment, rents and the support services and university administration are financed from the university's budget.

The university has two campuses, in Lappeenranta and in Lahti. On both campuses, there are also premises of LAB University of Applied Sciences (UAS). Two of the programmes in this accreditation cluster are offered in Lappeenranta, and three of them are provided in Lahti. On the Lappeenranta Campus, LUT has 21 lecture halls and 10 computer classrooms and an Exam Aquarium for online exams. In addition, there is a multipurpose hall where, for example, exams can be arranged. If needed, LUT can utilize the teaching premises and facilities of LAB UAS and vice versa. On the Lahti Campus there are 44 lecture halls and 14 computer classrooms and an Exam Aquarium in use by both higher education institutions, LUT and LAB. One building of the Lappeenranta campus was under renovation in 2016-2018, at the time of the last ASIIN accreditation round. After the renovation, the university now has renewed laboratories and modern facilities with multipurpose classrooms for teaching with different pedagogical approaches from traditional lecturing to problem/project based learning and online teaching. In addition, a new prototype laboratory, J. Hyneman Center (JHC), has been introduced to offer an easy access prototype laboratory on the Lappeenranta Campus. The goal is to create new ideas and give resources for both building and testing prototypes. JHC brings together students, LUT researchers and companies with a common goal of solving problems by creating. JHC is equipped with a wide variety of tools that are free of charge to all users.

As a response to the needs and feedback of students, the university had invested a great deal in online learning and teaching during the latest decade. Educational technology is heavily utilized in all courses of the programmes and new technological solutions are actively sought and tested. The Covid-19 pandemic accelerated the transition to online teaching and studying beginning from March 2020. The aim is to support learning and the progress of studies as well as diversify the pedagogical approaches of the courses using multifaceted means and e-learning tools. Different technologies have been introduced e.g. for recording lectures and taking exams, and support for the teaching staff has been strengthened. LUT's digital learning team, consisting of 10 staff members, helps the teaching staff of LUT and LAB in all phases of their education and training in technology related matters. Educational technology includes e.g. Moodle learning environment, making teaching videos and support for scientific writing using Turnitin."

"The Software Engineering department has three specialized workstation laboratories, which are applied in the educational topics of user interfaces and human-computer interaction, on the blockchain and cybersecurity research, and on the Linux and system programming contexts. These laboratories are at Lappeenranta campus, with the Linux laboratory being replicated in Lahti, and offer services to both Bachelor's programmes, and to the Master's programme in Software Engineering and Digital Transformation. Overall, the research activities focus mainly on the following themes: software development, digital transformation and user-centred design. The research focuses connected to the themes can be found in more details in LUT's webpages

LUT Academic Library is the joint library for the LUT University and LAB University of Applied Sciences. The library operates on two campuses: Lahti and Lappeenranta, providing services for LUT University students and staff, students and staff of LAB University of Applied Sciences, and outside customers. The library has an extensive collection of literature titles and journals, both printed and electronic. The library collections consist of approx. 61 500 printed book titles, 488 000 electronic book titles, 1100 printed journal titles, 56 000 e-journal titles and 5500 other information resources."

During the audit, the experts were shown advanced research laboratories with modern equipment. These laboratories are supported by technicians and are available for use by research staff and graduate students. In the on-site discussions, students confirm that they are satisfied with the resources and laboratories available and believe that these are used beneficially in the various courses.

The experts confirm that the teaching and office facilities, libraries and computer labs are adequate for all students and staff. In summary, the experts confirm that current funding allows standards to be maintained and additional instrumentation to be purchased if required, that LUT generally has sufficient workspace and laboratories, and that all laboratories are equipped with modern and sophisticated instrumentation.

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

Criterion 3.1 Staff and Staff Development:

In its statement, LUT explains that "[a]ccording to LUT's researchers leave policy, sabbatical can only be granted to full-time professors with a permanent work contract. Sabbatical is granted for 6 months, with the possibility of 12 months, but the second 6-month period must be financed by external funding. LUT School of Engineering Sciences has also provided funding for long researcher exchanges (at least 6 weeks), which are open to all researchers

and teachers having a doctoral degree. A total of 8 faculty members from Software Engineering department have utilized it in 2023 and 2024."

The experts are positive about the fact that, in addition to the sabbatical opportunities for full-time professors, there is also further funding that is available to all lecturers with a doctoral degree. During the audit discussions, it came across as if these opportunities were only available to full professors. As other lecturers are also given opportunities for research stays abroad, the experts refrained from the recommendation initially envisaged.

The experts consider criterion 3 to be fulfilled.

4. Transparency and Documentation

Criterion 4.1 Module Descriptions

Evidence:

- Module descriptions
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The module descriptions for all five study programmes under review here are accessible via the university website. The experts can confirm that the module descriptions of all programmes under review provide information on the module coordinators, teaching methods, workload, credit points awarded, intended learning outcomes, content coverage, applicability, admission and examination requirements, as well as assessment methods and a comprehensive explanation of how the final grade is calculated.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Exemplary diploma
- Exemplary diploma supplement
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:
The university confirms that all students receive a diploma supplement in English after graduation. The diploma supplements contain all relevant data, i.e., all the studies included in the degree, completed modules and their number of credits, grades and the total number of ECTS credits in the degree. LUT states that the diploma supplements "compl[y] 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."

However, the experts note that the same learning outcomes are presented in the two Diploma Supplements of the two Bachelor's degree programmes (see appendix). They are of the opinion that these should differ from each other, just as the ILOs described in 1.1 differ from each other, even if only slightly. In addition, the diploma of the Double Degree programme states 'Master of Arts' instead of 'Bachelor of Science'. Therefore, the experts demand a review of the Diploma Supplements of the two Bachelor's degree programmes and that the different learning outcomes of the two degree programmes be emphasised more clearly.

Criterion 4.3 Relevant Rules

Evidence:

- University regulations
- Degree regulations
- Self-assessment report

Preliminary assessment and analysis of the experts:
Relevant rules at LUT are communicated via the university regulations, the code of conduct of the university, and governmental rules are given by the Finnish Ministry's Universities' Act. All relevant rules are published on the university's website. The degree regulations give additional insight on teaching and studying at LUT. The experts can confirm that all rules

and regulations are transparent. During the audit, both teachers and students confirmed that they are aware of the rules and where to find them.

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

Criterion 4.2 Diploma and Diploma Supplement:

LUT provided two revised and updated versions of the Diploma Supplements for the two Bachelor's degree programmes. These now specify different learning objectives for each programme. In addition, the 'Master of Arts' has been removed from the diploma supplement of the double degree programme. This means that all the experts' remarks have been addressed and the criterion can now be assessed as fulfilled.

The experts consider criterion 4 to be fulfilled.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Statistics of curriculum work
- LUT Quality Manual
- Evaluations of surveys
- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The quality management system covers the university's core operations, i.e. academic education, scientific research, societal interaction and support services. Each programme undergoes a yearly curriculum work in which all levels of the programmes are evaluated and analysed. The curriculum work includes surveying stakeholders, among them students and teachers, as well as evaluating statistical data of the students (assessment grades, number of graduates, etc.). The statistical data and their interpretation show that feedback is taken seriously and that the university strives toward a smoother studying process for all people

involved. The students, teachers and industry representatives confirm this assumption during the audit saying that they are involved with in the curriculum work.

Furthermore, during the audit discussions, the students provide a comprehensive explanation of how quality management works within their programmes. They confirm that all course evaluations are conducted anonymously through online surveys, which are typically available during the last week of lectures. The results of these evaluations are shared with the QM team, the course instructors, and the programme coordinators. If any issues arise that require attention, they are discussed with the teaching staff. Additionally, the evaluation results are presented to the student guild in a workshop at least once a year, and there are regular meetings with the guild to discuss any concerns. In response to a question about the student guild, the students explain that it is a key feature at LUT, and is used for cooperation, events, and discussions related to academic and student life. Each discipline has its own student guild, and any student can apply to be part of it, with representatives being elected. Departments and campuses (Lahti and Lappeenranta) each have their own guilds. What is more, the students highlight that teachers also respond to the evaluation results through the Moodle platform. Students also have the option to raise complaints directly with the programme coordinators, and if necessary, forward them to the head of the department. Moreover, there are initiatives such as the “Teacher of the Year” award, which is based on evaluation feedback.

Summing up, the experts can see that the quality assurance is taken seriously and is working well. Changes to the curriculum are published and communicated to the students, who during the audit confirm their taking part in the quality enhancement and their visibility in the changes made.

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

The experts consider criterion 5 to be fulfilled.

D Additional Documents

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

„No additional documents needed.“

E Comment of the Higher Education Institution

The institution provided a detailed statement as well as the following additional documents:

- Reviewed Diploma Supplements for both Bachelor's degree programmes under review.

LUT provided the following statement:

Regarding Criterion 1.3 Curriculum:

- "For the future development of the BSc DD programme in Software and Systems Engineering, LUT has suggested to HEBUT that computer science courses in the programme could be provided by HEBUT School of AI, Computer science degree programme. LUT would still have a supporting role on those courses due to course management reasons. This change is justified in terms of competence profiles of both partners, as LUT's focus is more on software engineering and HEBUT focuses on computer science. The negotiations on cooperation agreement renewal between LUT and HEBUT are currently ongoing, and the peers' feedback will be taken into account. It supports LUT's intention to balance responsibilities of institutions in providing the BSc DD Software and Systems Engineering programme. LUT's aim to balance the responsibilities applies also to other DD-programmes accredited by ASIIN: BSc DD Mechanical Engineering and BSc DD Energy Technology."
- "At LUT, many MSc students work alongside with their studies, and some MSc programmes are even specifically addressed for people with employment. For example, the MSc programme in Software Product Management and Business is advertised as a programme, which is well suited for people already in the working world as it mainly utilizes blended and hybrid teaching. In the programme, the contact teaching is arranged on the Lahti campus on average once a month on Fridays from 9.00 to 17.00. All other teaching is conducted as online lectures, recordings, and other remote teaching methods. For many students with employment, it is not possible to complete their MSc studies in two years, which is the official target time by Finnish degree regulations set by Ministry of Education and Culture (MoEC). Universities funding model set by MoEC awards universities based on students' graduation times, which is reflected in the statistics we need to monitor. Currently the two years of full-time studies are the expected default to all International Master's programmes at LUT due to government regulations to fulfil the Visa requirements, and successfully complete the process of student admission. Thus, all MSc programmes are designed to be completable in two years even though we know that we have

many students that need more time to graduate. For them we can offer e.g. an optional timing template for courses."

Regarding Criterion 3.1 Staff and Development:

- "According to LUT's researchers leave policy, sabbatical can only be granted to full-time professors with a permanent work contract. Sabbatical is granted for 6 months, with the possibility of 12 months, but the second 6-month period must be financed by external funding. LUT School of Engineering Sciences has also provided funding for long researcher exchanges (at least 6 weeks), which are open to all researchers and teachers having a doctoral degree. A total of 8 faculty members from Software Engineering department have utilized it in 2023 and 2024."

Regarding Criterion 4.2:

- "According to LUT procedures the content of Diploma Supplements is reviewed in the beginning of the year. Therefore, if the intended learning outcomes (ILOs) change in any academic year, the update will take effect in Diploma Supplement at the beginning of the following year. That is the reason why the intended learning outcomes in the template Diploma Supplement of BSc programme Software and Systems Engineering DD submitted to ASIIN were the former ones in the beginning of the year 2024. The incorrect title "Master of Arts" in the submitted document was due to the fact that it was a template downloaded from the system and not a copy of the actual degree certificate. The first students from BSc programme SSE DD have graduated in the late Spring 2024 and we can now provide a real example of the degree certificate with Diploma Supplement. Attached are two examples of degree certificates to prove that ILOs on them are up-to-date:
    - Degree certificate: BSc programme Software Engineering
    - Degree certificate: BSc programme Software and Systems Engineering, DD."

F Summary: Expert recommendations

Taking into account the additional information and the comments given by LUT, the experts 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 Software Engineering	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ba Software and Systems Engineering (Double Degree)	With requirements for one year	30.09.2030	Euro-Inf®	30.09.2030
Ma Software Engineering and Digital Transformation	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ma Software Product Management and Business	Without requirements	30.09.2030	Euro-Inf®	30.09.2030
Ma Digital Systems and Service Development	Without requirements	30.09.2030	Euro-Inf®	30.09.2030

Requirements

For the Bachelor's degree programme Software and Systems Engineering (Double Degree)

A 1. (ASIIN 1.3) The proportion of the curriculum for which HEBUT is responsible must be increased in order to correspond to the character of a double degree and also to fulfil the mutual cooperation agreement.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to offer part time programmes.

E 2. (ASIIN 3.2) It is recommended to more strongly support students in their search for an internship.

G Comment of the Technical Committee 04 – Informatics/Computer Science

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and follows the experts' assessment without any changes.

Assessment and analysis for the award of the Euro-Inf® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

The Technical Committee 04 – Informatics/Computer Science recommends the award of the seals as follows:

Degree Programme	**ASIIN Seal**	**Maximum duration of accreditation**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Software Engineering	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ba Software and Systems Engineering (Double Degree)	With requirements for one year	30.09.2030	Euro-Inf®	30.09.2030
Ma Software Engineering and Digital Transformation	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ma Software Product Management and Business	Without requirements	30.09.2030	Euro-Inf®	30.09.2030
Ma Digital Systems and Service Development	Without requirements	30.09.2030	Euro-Inf®	30.09.2030

H Decision of the Accreditation Commission (24.09.2024)

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

The Accreditation Commission discusses the procedure and follows the experts' and the TC's assessment without any changes.

Assessment and analysis for the award of the Euro-Inf® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

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 Software Engineering	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ba Software and Systems Engineering (Double Degree)	With requirements for one year	30.09.2030	Euro-Inf®	30.09.2030
Ma Software Engineering and Digital Transformation	Without requirements	30.09.2031	Euro-Inf®	30.09.2031
Ma Software Product Management and Business	Without requirements	30.09.2030	Euro-Inf®	30.09.2030
Ma Digital Systems and Service Development	Without requirements	30.09.2030	Euro-Inf®	30.09.2030

Requirements

For the Bachelor's degree programme Software and Systems Engineering (Double Degree)

A 1. (ASIIN 1.3) The proportion of the curriculum for which HEBUT is responsible must be increased in order to correspond to the character of a double degree and also to fulfil the mutual cooperation agreement.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to offer part time programmes.

E 2. (ASIIN 3.2) It is recommended to more strongly support students in their search for an internship.

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's degree programme Software Engineering:

"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 critically 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 Software and Systems Engineering the graduate will be able to 1) apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to development of complex, scalable software systems, 2) demonstrate software engineering application domain knowledge and principles of selecting and the use of software matrices, 3) understand the dynamics of how teams develop and function, productively participate on software project with heterogeneous teams, 4) interact professionally with colleagues or clients and overcome challenges that arise from geographic distance, cultural differences, and multiple languages in the context of computing and software engineering, 5) communicate effectively both verbally and in writing, produce documents, and work as a part of a project team using both the domestic languages as well as English, 6) recognize the need for, and engage in, lifelong learning, 7) describe, design and solve problems by programming and using software engineering techniques and experimentation, 8) apply technical skills in different application domains taking into account technical, social, an economical constraints, 9) elicit, analyze and specify software requirements through a productive working relationship with project stakeholders, 10) apply appropriate codes of ethics and professional conduct to the solution of software engineering problems and 11) understand IT related business, entrepreneurship and innovation models.

The **curriculum** is presented under the following link: https://forms.lut.fi/opinto-opas/Tutkinto.aspx?id=otm-cc4d1ac7-3909-4f63-aceb-e42a22a7bd25&period=lut-curriculum-period-2022-2023&lang=en-US

According to Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Software and Systems Engineering (Double Degree):

"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 critically 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 Software and Systems Engineering the graduate will be able to 1) apply software engineering theory, principles, tools and processes, as well as the theory and principles of computer science and mathematics, to development of complex, scalable software systems, 2) demonstrate software engineering application domain knowledge and principles of selecting and the use of software matrices, 3) understand the dynamics of how teams develop and function, productively participate on software project with heterogeneous teams, 4) interact professionally with colleagues or clients and overcome challenges that arise from geographic distance, cultural differences, and multiple languages in the context of computing and software engineering, 5) communicate effectively both verbally and in writing, produce documents, and work as a part of a project team using both the domestic languages as well as English, 6) recognize the need for, and engage in, lifelong learning, 7) describe, design and solve problems by programming and using software engineering techniques and experimentation, 8) apply technical skills in different application domains taking into account technical, social, an economical constraints, 9) elicit, analyze and specify software requirements through a productive working relationship with project stakeholders, 10) apply appropriate codes of ethics and professional conduct to the

solution of software engineering problems and 11) understand IT related business, entrepreneurship and innovation models."

The **curriculum** is presented under the following link: https://forms.lut.fi/opinto-opas/Tutkinto.aspx?id=otm-2dfc3032-d4d5-47d4-ac76-dcc51c116fff&period=lut-curriculum-period-2022-2023&lang=en-US

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

"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.

The intended learning outcomes for the programme has been stated as follows: After completing the Master's programme in Software Engineering and Digital Transformation the graduate will be able to 1) describe and adapt computer science, software engineering knowledge, best practices, and standards appropriate to engineering complex software systems, 2) analyze a problem; identify and elicit functional, non-functional and sustainability requirements appropriate to its solution, 3) demonstrate the empiricism and familiarity with the methods of academic research and writing, 4) design, evaluate, and adapt software processes and software development tools to meet the needs of an advanced development project, 5) elicit user needs and design an effective software solution, 6) logically, convincingly, and effectively communicate both orally and in writing, 7) function effectively in teams and adapt teaming strategies to improve the productivity, 8) recognize human, security, social, entrepreneur issues and responsibilities relevant to engineering software and digitalization of services, 9) integrate into a multi-cultural working environment with practical orientation and collaborating in professional networks and 10) acknowledge lifelong learning as a way to stay up to date in the profession.

Software Engineering specialization

1) design software systems and define architectures in open and distributed environments in holistic and integrative manner and 2) apply software engineering best practices and standards for software development and evolution of diverse types of software systems.

Digital Transformation specialization

1) analyze and develop digital business models and value creation practices through re-engineering of processes and services and 2) evaluate business impact and cost benefits of digitalization on individuals, organizations, society and global context and design supporting digital platforms.

The **curriculum** is presented under the following link: https://forms.lut.fi/opinto-opas/Tutkinto.aspx?id=otm-5e396bab-3ca0-4e86-aa76-f334fc1056f0&period=lut-curriculum-period-2022-2023&lang=en-US

According to Diploma Supplement the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master's degree programme Software Product Management and Business:

"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.

The intended learning outcomes for the programme has been stated as follows: After completing the Master's Programme in Software Product Management and Business the graduate will be able to: 1) Analyze a problem; identify and elicit functional and non-functional requirement. 2) Design and evaluate a business case and its impacts for a software-intensive product or a service. 3) Adapt software engineering and product management

knowledge, best practices, and standards. 4) Design, evaluate, and adapt software processes and software development tools to meet the needs of a development project. 5) Analyze, develop and manage new software-based digital products in the software industry. 6) Communicate logically, convincingly, and effectively both orally and in writing. 7) Function effectively in teams and adapt teaming strategies to improve the productivity. 8) Recognize human, security, social, entrepreneur issues and responsibilities relevant to engineering software and digitalization of services. 9) lntegrate into a multi-cultural working environment with practical orientation and collaborating in professional networks. 10) Demonstrate the empiricism and familiarity with the methods of academic research and writing. 11) Acknowledge life-long (earning as a way to stay up to date in the profession."

The **curriculum** is presented under the following link: https://forms.lut.fi/opinto-opas/tutkinto.aspx?id=otm-b8f46e27-7aaa-4045-b4fc-7fdbb5a96b66&period=lut-curriculum-period-2023-2024&lang=en-US

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

"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.

The intended learning outcomes for the programme has been stated as follows: After completing the Master's Programme in Digital Systems and Service Development the graduate will be able to: 1) Become an expert in the development of human-centered digital services that incorporate state-of-the-art digital technologies. 2) Learn to analyse a problem, identify and elicit human-centered needs and values for digital services. 3) Design, develop and evaluate data-driven and connected software-intensive smart services. 4) Apply, evaluate,

and adapt software processes and software development tools to meet the needs of human-driven digital services. 5) Analyse, develop and manage new software-based digital services in the industry."

The **curriculum** is presented under the following link: https://forms.lut.fi/opinto-opas/tutkinto.aspx?id=otm-6997a60a-2942-48f7-83c1-da69d2e17ee7&period=lut-curriculum-period-2023-2024&lang=en-US