ACCREDITATION OF THE DEGREE PROGRAMME IN ICT AT JAMK UNIVERSITY OF APPLIED SCIENCES 2023

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FINEEC

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Description of the accreditation process and of the programme

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1.1 Aim of the accreditation

The aim of FINEEC's Engineering Programme Accreditations is to support the enhancement of quality in engineering degree programmes and to provide higher education institutions with the means of deciding whether an engineering degree programme provides its graduates with the academic qualifications necessary for a career in the engineering profession. The accreditation assesses the way an engineering degree programme is planned, delivered and developed to ensure that the students reach the programme outcomes and how the programme outcomes align with the reference programme outcomes set in the FINEEC Engineering Programme Accreditations manual (FINEEC 1:2022). The reference programme outcomes describe the knowledge, skills and competencies that engineering students should have acquired by the time they have completed a degree programme in engineering. The accreditation evaluates the extent to which the set of standards for programme's planning, implementation, resources and quality management are met.

1.2 Degree Programme in ICT

The Degree Programme in ICT belongs to the Jamk University of Applied Sciences and its Instute of Information Technology. Jamk is located in Central Finland, having a main campus in Jyväskylä. The Degree Programme leads to a Bachelor of Engineering degree. Language of instruction is Finnish. However, the students have an opportunity to study the courses also in English. The degree programme consists of 240 ECTS and the intended study time for full-time studies is 4 years. Yearly intake is 90 students, including full-time and part-time students. Both full-time studies and part-time studies follow the same curriculum. The studies are supported by distance learning.

The degree programme has three specialization areas implemented through modules that students can choose, as follows:

- Software Engineering / Software Development (Dev)
- Cyber Security (Sec)
- Data Networks and Servers (Ops)

The accreditation covers both full-time and part-time implementation of the degree programme. In addition, it was stated in the accreditation agreement between FINEEC and Jamk, that the similar degree programme in the same field instructed in English at Jamk is also included in the accreditation decision to be taken by the FINEEC Committee for Engineering Education.

1.3 The accreditation process

The accreditation was conducted in accordance with the principles set in the FINEEC standards and procedures for engineering programme accreditation document (FINEEC 1:2022). This was a re-accreditation of the degree programme, as it was accredited for the first time in 2017 by FINEEC. Therefore, some of the recommendations given in the previous accreditation report are also reflected in this report.

The schedule of the accreditation was the following:

1. The accreditation team was appointed by the FINEEC Committee for Engineering Education on 17th February 2023.
2. JAMK University of Applied Sciences submitted the self-evaluation report on 27th February 2023.
3. A site-visit to the degree programme was conducted on 28-29 March 2023. The programme of the visit is given in table 1. In addition, based on the oral agreement between Jamk and FINEEC, one extra online interview was carried out on 5th April 2023. This was due to the lack of the availability of some key staff members during the site-visit.
4. Decision making meeting of FINEEC Committee for Engineering Education on 9th June 2023.

TABLE 1. Site-visit programme

Tuesday 28.3.2023	Wednesday 29.3.2023
09.00-10.00 1: Interview with the Jamk UAS and the degree programme management	09.00-9.50 5: Interview with the external stakeholders
10.15.-11.15 2: Interview with the academic staff	10.05-10.55 6: Interview with the students
11.30-12.20 3: Interview with the support services staff	11.10.-12.00 7: Interview with the alumni of the degree programme
13.35-15.40 4: Facilities tour	13.15-14.45 8: Academic staff presented examples on the teaching and assessment methods (demos)
15.40-17.00 Accreditation team meeting	15.00-16.30 Accreditation team meeting
	16.45-17.30 9: Initial feedback for the Jamk UAS and the degree pro-gramme

1.4 The accreditation team

Chair of the team:

FH-Prof. Mag. Dipl.-Ing. Dr. **Friedrich Praus**, UAS Technikum Wien (Austria)

Team members:

Student **Paula Lozano Duarte**, Universidad Pública de Navarra (Spain)

Principal Lecturer, PhD **Tanja Korhonen**, Kajaani University of Applied Sciences (Finland)

Director **Joonas Lyytinen**, Barona (Finland)

Senior Evaluation Advisor **Kati Isoaho** from FINEEC acted as a project manager of the accreditation.

1.5 Evidence used in the accreditation

Self-assessment report, along with the following appendices:

1. Advisory Board composition of the Institute of Information Technology in 2023.
2. Example on the minutes of the Advisory Board meeting in 2022.
3. Key figures of the degree programme under review.
4. Description of the Jamk common competences mapped against the FINEEC reference programme outcomes.

The curriculum of the degree programme for the academic year 2022-2023 was used in this accreditation.

In addition, the accreditation team requested and received the following extra materials from Jamk and the degree programme under review:

- Description on the key development operations based on the previous EUR-ACE accreditation of the same degree programme in 2017 by FINEEC.
- Description of the typical study path(s) of the degree programme.
- Description on following matters concerning the degree programme: How students are selected to different specializations (criteria, procedure etc.)? Can they select courses from multiple specializations? Do all the different specializations take place each year?
- Description on the following matters concerning the degree programme: How are the students involved in the RDI projects and how does it improve their learning outcomes?
- Description on the following matters concerning the degree programme: How is it assessed that the applied mathematics and natural sciences courses provide the students necessary mathematical tools and skills they need in further studies and e.g in thesis work?

- Description on the following matters concerning the degree programme: How and with what criteria are the industry partners selected? Do they get any guidance and/or training on how to support the students when they do thesis work for the company?
- Two detailed case descriptions (courses) on the links between programme outcomes, course level learning outcomes as well as FINEEC reference programme outcomes. The selected cases were Full Stack Programming course and Cyber Security course.
- Description on how the degree programme ensures, that workload allocation is balanced through the study years and students have a possibility to complete 60 ECTS per year

A Moodle course functioning as an electronic evidence room was provided to the accreditation team. It contained information and materials about the following topics:

- Quality Management
- Management, publications and staff
- Courses
- Theses
- Research, Development and Innovation
- Practical Training Process
- International co-operation
- Additional material

- The accreditation team had access to the Jamk staff intranet (including a Moodle learning platform) during the review process.

- Information gathered during the onsite visit within the interviews with the Jamk UAS and the degree programme management, academic staff, support services staff, current students, alumni as well as key stakeholders. Teaching staff was met twice, in the traditional interview as well as in the teaching demo session.

Evaluation of the fulfilment of the accreditation standards

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2.1 Planning of the programme

Standard 1	The programme aims, which describe the educational task and purpose of the programme, are consistent with the mission of the higher education institution and reflect the identified needs of employers and other stakeholders.

The degree programme under review has defined the aims of the programme as follows:

"The general aim of studies leading to a bachelor's degree is that the student acquires, based on the demands and development of working life, the necessary skills and knowledge for working in a professional specialist position. The students can apply the basic laws of natural sciences to solve problems in their own field. They master the skills to build information technology in an increasingly digitalised and automated society. They are capable of ethically planning, building, and testing information technology solutions for the needs of working life. After graduation, information and communications technology engineers may work in the fields of industry, engineering, sales, technical support, education, services, and the public sector."

The mission of Jamk is *creating competence*. This mission is clearly apparent also in the degree programme under review, which specializes on DevSecOps, meaning (Software) Development, (Cyber) Security and (Data Network/IT) Operations. Jamk has defined six focus areas in its strategy as follows: Bioeconomy, Innovative Learning, Tourism, Automation and Robotics, Multidisciplinary Rehabilitation, and Applied Cybersecurity. As stated in the self-assessment report, the degree programme under review has a very important role in the following focus areas: Automation and Robotics, Bioeconomy, and Applied Cybersecurity. Applied Cybersecurity, one of Jamk's focus areas, was also profoundly present in the site-visit programme, which included observation of cyber security training with stakeholders.

Jamk is currently also involved in some externally funded projects with the aim to increase cybersecurity expertise nationally and internationally. One of them is being funded by the Regional Council of Central Finland and another one by the Ministry of Education and Culture. The latter one will increase the cooperation and division of labour of higher education institutions in the

provision of research-based cybersecurity education, as well as develop and increase the cyber security study units offered to degree students in various fields.

The programme aims and a structure of the curriculum are presented frequently to the degree programme´s Advisory Board that is used well as a contact to industry to get insight into needed competences. Some of the industry also has contract-based co-operation with the programme. The degree programme also has an active community of alumni which offers insight on the educational needs of the labour market. Different stakeholders have continuous cooperation with the degree programme. R&D projects, academic staff contacts and networks as well as business services are also seen as a good source for topical feedback nationally and internationally. The national feedback survey (AVOP) is also followed to receive feedback on how the degree programme has fulfilled graduates' working life expectations. The aims of the degree programme are in line with stakeholders' comments and industry needs.

The degree programme has noticed the rapid development and change in technology and applied this to their curriculum, which is seen as new/updated curricula in the past years.

To conclude, the programme aims are consistent with the mission and strategy of the institution. Furthermore, the programme aims reflect the needs of society and the stakeholders who are frequently consulted.

Based on the team's assessment, the programme meets standard 1 fully.

Standard 2	The programme learning outcomes, which describe the knowledge, understanding, skills and abilities that the programme enables graduates to demonstrate, are consistent with the programme aims, with relevant national qualifications frameworks (if applicable) and with the FINEEC reference programme learning outcomes.

The programme learning outcomes of the degree programme under review are publicly available on Jamk's website generated from the Peppi study system software. In addition to this, a description of the programme outcomes was included in the self-assessment report submitted by the degree programme.

The programme learning outcomes have been defined by an expert team consisting of teachers and staff members at the Institute of Information Technology. They include the common learning outcomes that are part of every Jamk bachelor's degrees:

- learning and information management competence
- entrepreneurship, innovation and working community competence
- internationalisation and communications competence and
- ethical competence.

As stated in the self-assessment report, the degree programme aims to provide the students with good readiness to act in specialist tasks in the field of ICT in a constantly changing internationalizing society. ICT knowledge is provided with several specialization options: Development, Security, and Operations. In addition, the following programme level knowledge, skills and competences are intended to be gained during the completion of the degree programme:

- extensive basic practical knowledge and skills and their theoretical foundations for working in a specialist position in the field,
- the ability to follow developments in the field,
- skills for self-improvement and continuous training,
- sufficient communication and language skills, and
- skills required for international activities in the field.

Despite being worded to some extent differently in the two sources mentioned above, they are consistent with the overall programme aims.

For these learning outcomes also a table has been provided in the appendix of the self-assessment report, which shows a clear mapping of FINEEC reference outcomes and the common learning outcomes of Jamk.

The professional learning outcomes have been developed is such way that they directly correlate the FINEEC reference programme learning outcomes for a bachelor's degree, classified by the following categories:

- Knowledge and Understanding
- Engineering Practice
- Investigations and information retrieval
- Multidisciplinary competences
- Communication and Teamworking

Each course contributes to one or more programme learning outcome category. This is stated in the course descriptions as well as on the Peppi website in the classification view "Bachelor's Degree: EUR-ACE competences in Technology 2020-2023".

The National Qualification Framework (NQF) has been taken into account as the general attributes of the graduates have been defined based on the competence descriptions of level 6 of the European Quality Framework (EQF).

Based on the team's assessment, the programme meets standard 2 fully.

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Standard 3   The course level learning outcomes, including thesis work and possible practical training, aggregate to the programme's learning outcomes.

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The curriculum of the degree programme has been designed according to the "Principles of the Curricula for Degree-awarding Education (Bachelor's Degree, Master's Degree) at Jamk University of Applied Sciences". After the previous accreditation, the degree programme has been structured in a way that the first two years of basic studies and Jamk common studies are the same for all students. Afterwards students may choose their specialization area from several modules. In addition, the recommendations given in the previous accreditation have also been taken into account. In the previous report it was required, among other things, that the learning outcomes of all modules and courses should be described in terms of competences students are able to demonstrate after completion and course descriptions should provide comprehensive information (in particular learning outcomes, content, teaching methods/activities, assessment of students' learning) about all the courses in the curriculum.

The curriculum is presented on the Peppi software website as tables, with different views. On the one hand a structural view can be selected, on the other hand a timing view can be shown. Additional modules, such as "Robotics" or "Game Production" can be selected as specialization areas according to the website.

The first two years are (nearly) identical to all students and cover common basic studies for ICT (data network technology, software technology), natural sciences and transferable skills. For the third year, students may select different modules. The three specialisation areas of Software Engineering / Software Development, Cyber Security and Data Networks and Servers are mentioned in the self-assessment report. There are further modules mentioned on the Peppi website.

Additionally, on the degree programme website, it can be seen by a provided mapping how each course contributes to the FINEEC reference programme learning outcomes and thus to the overall programme aims. Additionally, each course description also includes references to the programme learning outcomes it contributes to. However, the accreditation team has to note that the course description is the responsibility of the teacher and content such as learning outcomes or prerequisites are not systematically generated or mapped. Thus, even if the process requires approval by the programme director prior to publication, inconsistencies are still present in some course descriptions.

Hence, as a general finding the accreditation team has to note that considering the provided (inconsistent) information it is hard to figure out of the study path available. Therefore, the assessment of this standard does not seem fully possible regarding the question of whether all individual courses constitute to the programme learning outcomes and whether they are achieved at time of the completion of the degree programme. Although the staff can follow the study paths of the individual students through the Peppi system, typical combinations are not available for the applicants or wider audience.

However, the interviews with students, alumni and teachers as well as extra material provided by the degree programme revealed that students are supported in selecting their specialization area by (1) a dedicated event being organized every year, (2) tutors guiding them from a working life perspective (3) an additional Finnish language website available during the admission process. Therefore, the accreditation team was convinced that students are given the needed guidance related to the selection of their studies. Thus, the achievement of the degree programme level learning outcomes is facilitated via guidance practises. However, the possible combinations of the modules are several, and the degree programme has not so far publicly documented typical or recommended study paths for the applicants, students and the wider public. This is recommended for the two reasons. First, it should be clearly ensured that all the combinations lead to the achievement of the programme outcomes set. Second, the students, applicants and the wider public should have public information on the typical or recommended study paths.

In addition, as a general finding, the accreditation team has to note that similarly to the accreditation report from 2017, "course level learning outcomes for some of the courses were presented in very general terms and described the acquired competences only partly, making it in some cases hard to see the exact ways the courses learning outcomes aggregate to the programme level learning outcomes. Attention should be paid to the definition of the learning outcomes on the course level of the programme". Clear guidelines for the lecturers (e.g., 1 ECTS = 1 learning outcome, preferred ways to formulate learning outcomes with fixed phrases, common verbs, min/max length) might be helpful.

Additional material was requested from Jamk that would describe exemplarily how individual courses aggregate to the programme learning outcomes. Jamk provided a table for the courses

"Cyber Security" and "Full Stack Programming", which provided the necessary evidence. Each learning outcome of a course has been mapped to a FINEEC reference learning outcome category. It might be helpful for the whole degree programme to provide teachers such a template in advance, probably with the above-mentioned guidelines, to be able to systematically enhance the formulation of course level learning outcomes.

Finally, the accreditation team notes that most descriptions of course learning outcomes fulfil the requirements.

Based on the team's assessment, the programme meets standard 3 conditionally.

Standard 4	The curriculum gives comprehensive information on all the individual courses of the programme, including thesis work and possible practical training, and is accessible to students.

The curriculum of the degree programme is publicly available on the Jamk website. As mentioned before, the content of the website is produced through the Peppi system. The curriculum describes general information regarding the degree programme and then specifically presents each course, the amount of ECTS earned and the timing of the study. The curriculum has several view options to choose from. The timing can be seen on a study year or semester level. The user can also check the EUR-ACE competences in one view.

When selecting an individual course, the description presents learning outcomes (course competences, the object of the course and the learning objectives), course contents, further information regarding the course, prerequisites and co-requisites, the evaluation scale and assessment criteria. In most courses, also the EUR-ACE competences are mentioned in the course description. Perhaps some of the common Jamk level courses do not mention those in descriptions, but those are shown in EUR-ACE competence view. It is also possible to find more information via the upcoming implementations section.

The accreditation team noted that in some course descriptions of the prerequisite skills/courses were missing or not mentioned. It was also observed, however, that students additionally use the internal commercial TUUDO application, which gives them easily understandable details about studies, courses and study life.

Based on the team's assessment, the programme meets standard 4 fully.

Standard 5	The curriculum and the course timetable enable students to graduate in the expected time.

The degree programme under review is designed to be highly flexible, with numerous elective modules and minimal obligatory courses after the two first years. However, students are provided with recommendations for modules related to their chosen area of specialization, and the timetable is arranged to prevent scheduling conflicts between recommended modules and courses. As explained in the accreditation material, not all the modules designed for the curriculum are available every year. The degree programme annually organises an event where all the modules are presented for the students. At the time of the Covid pandemic, events were held online. Additionally, examples of the recommended combinations are offered to assist students´ choices. After the event, students can vote for their three favourite modules. Based on the results, the degree programme selects the modules for the next implementation period.

The accreditation material included some examples of the possible study paths presented by the degree programme, which illustrated well the available choices and their combinations. This confirms that the degree programme has a handle on the varying possibilities offered for the students within the current curriculum. Furthermore, the degree programme has established practices for ensuring the intended use of the curricula and involving students´ opinion in the planning of implementation.

Each student works with a tutor teacher to create a personal learning plan (PLP), which is designed to help the student graduate in the shortest time possible. The accreditation team was able to confirm during interviews that these individual learning plans are indeed created with the goal of expediting graduation.

As stated in the self-assessment report, the programme coordinator makes a draft of delivery for the next academic year every spring. The specific resource plan for each semester is prepared during the previous semester. The programme coordinator chooses the suitable lecturers responsible for each course, mostly among the staff of the department. When necessary, specialists from the industry and the university network are invited. Student feedback is considered when the delivery of the curriculum is being planned.

In addition, a course schedule is prepared for every course. The lecturer responsible for the course presents the course schedule during the first contact teaching session of every course as described in the Jamk degree regulations. The course schedule includes presenting the contents of the course, the recognition of prior learning, attendance requirements, assessment criteria and important dates (exam dates, course work, mid-term feedback). The students are also provided with an electronic version of the course plan and the assessment criteria in the virtual learning environment of each course.

Based on the self-assessment report, the degree programme has made some progress in recent years when it comes to the percentage of students that have completed their studies in six years after the start of their studies. The degree programme itself has defined timely graduation as one its development areas. The latest provided percentage from 2021—60%—is higher than the national average in the same field at the universities of applied sciences.

As a summary it can be noted that the degree programme provides in general a possibility to complete the degree in the intended study time. However, it was evident that in practise the number of ECTS gained by the individual students per academic year vary a lot along with the actual study time, e.g., due to the working alongside of studies.

Based on the team's assessment, the programme meets standard 5 fully.

Standard 6	The criteria and process for student admission and transfer are clearly specified and published. Students should be informed of the qualifications necessary to enter the programme.

The admissions process for Finnish universities of applied sciences is regulated and standardized, with detailed specifications. Jamk also has defined internal rules for admission and transfer in the document "Degree regulations of Jamk University of Applied Sciences (2022)". The application to the degree programme under review takes place through the electronic joint national application system. The director of the school makes the decision on student selection. Processes relates to the different stages of admission are described in Jamk´s quality manual. The process complies with the national admission criteria set by the Rectors' Conference of Finnish Universities of

Applied Sciences (Arene). The student selection and the admission criteria are described on the Jamk website.

To assist and guide applicants, Jamk offers various sources of information, including the Jamk website, which provides documents and sections such as the "Study Guide" and "How to Apply", and makes admission criteria publicly accessible. Printed flyers are also available for interested applicants, which provide all the necessary details and web links related to the admissions process. Additionally, the Admission Coordinator is available to answer any further questions that prospective applicants may have.

Based on the team's assessment, the programme meets standard 6 fully.

Standard 7   Students are informed of regulations and guidelines that concern recognition of prior learning, progress of studies and graduation.

Procedures for recognition of prior learning are defined at the Jamk level in the "Jamk Degree Regulations" and Study guide, which are available on the Jamk web site. Further advice on procedures of recognition of prior learning is available through the study affairs office, teacher tutors and the programme coordinators. The starting point of recognition of informal learning is the learning described as a curricular objective, which the student may have acquired in any way, any place and at any time. Competence is recognised either by means of an accreditation decision or an assessment decision. Additionally, recognition of prior learning and experience also takes place in connection with studification.

Recognition of prior learning is possible in two primary ways: replacement and inclusion. Replacement means the replacement of studies included in the curriculum with higher education studies of at least the same level (EQF/NQF 6 or EQF/NQF7) and with similar learning objectives completed elsewhere in the same field of study. Inclusion refers to the inclusion of higher education studies of at least the same level (EQF/NQF 6 or EQF/NQF7) completed elsewhere as part of the degree. A recognition decision will be made about any replacement or inclusion.

Studification is an alternative method of developing competence on the module or course level at Jamk. It refers to combining work or project studies, such as Future Factory activities, with the studies. The student must draft a studification plan and document it in the manner agreed upon with the teacher.

The student has the right, but no obligation to apply for accreditation and recognition of prior learning. This does not apply to studies completed as part of the degree as cross-institutional studies or during international student exchange, the accreditation of which the student will agree upon as part of their personal learning plan. The student may apply for accreditation of higher education studies completed elsewhere (open studies or another institute of higher education) or recognition of informal learning they have acquired in other ways. A student may also apply for accreditation of leadership and instructor training acquired during military service. Studies that are included in the education required for entrance eligibility cannot be accredited as part of the degree. A full degree cannot be accredited as such.

The accreditation team had the impression that students that desired recognition of prior learning have the means and tools to find all the information they need.

Jamk has a process and regulations in place for transfer. Students may apply for transfer to Jamk if they are entitled to study at another Finnish university or university of applied sciences and are in

a similar degree programme aiming for the same degree or qualification title. Admission as a transfer student is based on an application according to Jamk's instructions regarding transfer students and the admission criteria. A student already studying at Jamk may also apply for a transfer to another degree programme within the same field of study if the selection criteria are the same for both programmes. The decision on admission is made by the director of the school. There is also a process in place for requesting a rectification of a decision.

The learning process of students can be monitored by various measures. On the one hand, tools exist for monitoring the progress in different levels, e.g., from student or degree level view. Students, e.g., who only got some ECTS during a semester can be identified and then be contacted by study counsellors. At the programme level, reports providing the number of graduates and progress, or dropout rates are available. Also, research is done on how outcomes of the courses relate to dropout. In digital courses a system has been developed which follows the submission of assignments. Teachers can contact those students that are missing a submission. In an electronic workspace teachers can see who has read the course materials and started to do the assignments. Besides, the teachers in the degree programme are ICT professionals and data analysts, providing them with good technology on how to collect data. In case of student problems, support is possible early. On the other hand, feedback processes such as course feedback, mid-term feedback or grumble week have been established. Students did not complain about, e.g., missing possibilities to retake an exam or a course or lacking support of services which might hinder their learning process. Students and alumni positively mentioned the practical training, project work with companies and thesis process, which enables them to achieve the programme level learning outcomes.

Jamk has a process in place for graduation as well as awarding degree certificates. A student who has completed a bachelor's degree will receive a digital certificate in Finnish, indicating the completed degree and its scope, the degree title and the name of the degree programme, the specialisation option (if any), the core content of the studies, the title of the thesis, the language of the maturity test or other assignment demonstrating their competence in the field, a statement on the language skills required of state officials functioning in a bilingual office, and other facts of relevance.

The transcript of records which lists the study attainments and their assessments, is attached to the degree certificate. If students who graduate from degree programmes with instruction in Finnish would like to receive an English-language degree certificate, it can be ordered for a fee in connection with the Finnish-language certificate application but not afterwards.

The Diploma Supplement is an English language annex, which is automatically given with a degree certificate free of charge to all students. The Diploma Supplement contains information about Jamk, the education and study attainments (transcript of records), and their level and status in the Finnish educational system.

Based on the team's assessment, the programme meets standard 7 fully.

> **Strengths, good practice and areas for further development regarding section 2.1: planning of the programme.**

The team notes the following strengths and good practices in this section:

- The planning and development of the curriculum takes into account the needs of external stakeholders, which yields very positive feedback from employers and graduates.

- The degree programme is based on industry needs and the content has been updated according to changes in the technological field. Up-to-date specialisation areas have been established.
- The degree programme has strong cooperations with several organisations and students are offered outstanding unique learning environments.
- The degree programme assigns a tutor to each student to assist in creating an individualized personal learning plan (PLP) that is tailored to the student's needs and goals. The PLP is designed to help the student graduate as quickly and efficiently as possible.

The team sees the following as areas for further development in this section:

- It is hard to figure out of the possible study module combinations on a formal accreditation basis, due to the various possible specialisation areas and especially since not all the modules designed for the curriculum are available every year.
- The degree programme needs to describe and publicly document the typical and/or recommended study paths within the degree programme for the applicants, students and the wider public. Furthermore, there should be a procedure in place for ensuring that all the study paths allow achieving the intended programme outcomes.
- The formulation of the course level learning outcomes should be enhanced, to provide a homogenous and consistent view throughout the whole curriculum.
- The course descriptions should be checked regarding the prerequisite skills/courses.
- Measurements supporting the timely graduation of students, additionally considering the changed demands to teaching after the COVID-19 pandemic, should be implemented.

2.2 Implementation of teaching and learning

Standard 8	The teaching and learning process, including the assessment of students, enables students to demonstrate that they have achieved the intended course and programme level learning outcomes. Students have an active role in co-creating the learning process and the assessment of students reflects this approach

According to the "Pedagogical Principles" set by Jamk in 2017, the student is the owner of the learning process and is responsible for it. Thus, all students have to create a personal learning plan (PLP) and a career plan at the beginning of their studies, which is updated every year. The PLP administration tool is part of the Peppi system and assists students, teachers, career tutors and programme coordinators to monitor the learning process. Students are supported by career tutors and the study counsellor in adapting this plan enabling flexible learning paths and encouraging students to take an active role in co-creating the learning process.

Based on the information available in the self-evaluation report as well as feedback gained during the site-visit, the accreditation team is of the opinion that the monitoring of students provides evidence of the effectiveness of the learning process in the course units/modules as well as the whole learning process.

It has to be noted that the COVID pandemic clearly has influenced the learning process in recent years. Feedback gained during the site-visit often referred to the missing presence courses. Some students managed to achieve the learning outcomes of (online) courses, some students did not. Some teachers performed better, some had room for improvement in their courses. Drop-out

seems to have increased due to lack of social contact. The overall feeling during the site visit was that pure online courses hinder the achievement of learning outcomes. In fact, the pandemic has also solidified the digital transformation and the degree programme has strongly emphasized their input on e-learning possibilities and multi-faceted learning environments. All study materials are accessible in digital format and a lot of lectures are found as videos too. The assessment and feed-back methods have also been updated to support e-learning. This era has also led to some new challenges with young students, since many students want to perform online courses and it is hard to find solutions to get the students back to Jamk campuses and reach the learning outcomes. Supportive actions have been taken to cope with the situation.

Additionally, international mobility stopped due to the COVID pandemic, which makes it impossible for the accreditation team to assess this point. Discussions with alumni of the degree programme before the pandemic, however, reveals that students appreciate international activi-ties, such as a trip to Singapore, during their studies.

Student learning is assessed in various methods as teaching and learning also follows several different methods. Many courses include case studies, group work, personal assignments and learning games. Theory is introduced at the beginning of most courses. Then students apply the theory in practice by doing exercises and assignments during the course. Many assignments are carried out as laboratory work using the private cloud service, GitLab or the Virtual Learning Environment (VLE) of Jamk. The supervision of a student's personal progress is, e.g., performed through individual version control or individual feedback. Automated assessment is likewise used in some courses as Moodle functions, such as inserting lab measurement data into Moodle tools. Room for improvement lies in the automatic assessment and plagiarism checking for non-trivial source code. Other courses have exams that test the knowledge and understanding of the student.

The overall opinion of students and alumni was that they would clearly recommend the degree programme, since the teaching and learning process enables students to achieve the course and programme learning outcomes, student learning is assessed in a suitable way, and students play an important role in the teaching and learning process.

Knowledge and understanding

- knowledge and understanding of mathematics and other basic sciences underlying their engineering specialisation, at a level necessary to achieve the other programme learning outcomes;
- knowledge and understanding of engineering disciplines underlying their specialisation, at a level necessary to achieve the other programme learning outcomes, including some awareness at the forefront;
- knowledge and understanding of applicable materials, equipment and tools, engineering technologies and processes, and of their limitations, in their specialisation
- knowledge and understanding of applicable techniques and methods of analysis, design and investigation, and of their limitations, in their specialisation;

Learning outcomes relating to knowledge and understanding are weighted to the first and second year of studies. Students do 30 ETCS out of the required 240 in courses related to natural sciences and mathematics. Jamk offers altogether 13 courses in this area in total, of which students choose 10 by picking two out of five possible applied mathematics courses. The four courses of physics contain relevant laboratory work where students are required to proceed from measurements of phenomena to data analysis, conclusion and report writing.

The teaching of basic sciences underwent a drastic change over the pandemic with a very abrupt switch from on-site to on-line learning. The teaching staff of Jamk has responded to this actively by building new online learning environments where students can access the learning materials and exercises where and whenever they want with in-person teaching developing more towards individual mentoring and supporting students with difficulties of reaching the learning outcomes of the courses. Some mathematics courses have also started to utilize peer-review by other students and automated review for exercises.

In recent years there has been a general decline in mathematics skills for students graduating from primary and secondary schools and this development has been observed also among the student population in Jamk. These difficulties are especially prevalent among students who have a background in vocational education instead of general upper secondary education. The teaching staff also reported that some students struggle with some mathematical concepts and practices needed in further ICT engineering studies such as representation of numbers between different number systems (binary, hexadecimal) and conversions between these. Some students also reported that for them mathematics was hard to learn with remote only implementation of courses and wished that it would be easier to pose questions to teachers face to face.

The relevance of basic sciences and mathematics in engineering education is understood by the degree programme and the courses also teach practical skills and competencies essential for a career in engineering such as data manipulation, analysis and visualization with different tools. Jamk has also observed the difficulties some students have with mathematical skills and practices and has responded with providing additional supportive mathematics courses at the early stages of the studies to students in need of extra training.

Engineering practice: analysis, problem-solving, design, practice

The engineering in practice learning outcomes are gathered throughout the studies in 22 mandatory courses with 120 ECTS. At the end of the mandatory courses, the Future Factory course combines all previously studied courses into a larger project with the learning outcome of completing a complex engineering task requiring economic, organisational and managerial skills.

This report is further divided into the sections analysis, problem-solving, design and practice due to formatting reasons.

Analysis

- ability to analyse complex engineering products, processes and systems, and to correctly interpret the outcomes of such analyses, by being able to select and having the practical skills to apply relevant established analytical, computational and experimental techniques and methods

Data structures and Algorithms and Project Management and Practices are mentioned as building analysing skills. The testing environments provide an excellent possibility to analyse products, processes, and systems. Analysing tests and making conclusions from physics labs and data analytics were good examples of practically learning analytical, computational, and experimental techniques and methods.

Problem-solving

> • ability to identify, formulate and solve complex engineering problems, by being able to select and having the practical skills to apply relevant established analytical, computational and experimental techniques and methods

Problem-solving competences are best gained in practical courses such as labs. JAMK provides various dedicated lab courses as well as courses with organised assignments carried out as laboratory work where students solve real engineering problems.

In the Future Factory course (10 ECTS), the object is to acquire the skills to plan and implement work life development projects as teamwork. Students learn the good practices of information and communication technology. The Peppi system also shows the WIMMA Lab course (15 ECTS).

In the Data Networks course (5 ECTS) students learn the structure and protocols of data networks and know the principles of planning a data network. Students are provided a whole network from JAMKs virtual lab environment and have to solve assessments within this laboratory. In the Ethical Hacking module, students are guided in the beginning and solve the complex assignments at the end, being supervised by the teacher.

One strength of the degree programme under review is the integration of outstanding laboratory environments which are based on experiences gathered in R&D projects.

Design

> • ability to develop and design complex products (devices, artefacts, etc.), processes and systems to meet established requirements that can include societal, health and safety, environmental, economic and industrial constraints, by being able to select and having the practical skills to apply relevant design methodologies
> • practical skills for realising complex engineering designs
> • ability to use the awareness of the forefront of their engineering specialisation in design and development

There are not many courses that specifically cover design in the curriculum of the degree programme. Software Design and Testing is provided in the support studies module that includes the basics of software requirement definition and software design description languages (UML). However, there are several practical project courses such as WIMMA Lab, Future Factory and Advanced Programming Project that require the students to follow the whole process of software development including design. Design related skills are also included in other courses such as Object-oriented Programming, where UML is one of the learning outcomes.

Some alumni reported that it would have been beneficial for their later work career to learn more about cloud architecture design, and it would be advisable for Jamk to consider adding some courses about the basic concepts of designing systems in the commercially available cloud platforms since these skills are going to be increasingly relevant in the ICT sector moving forward.

Based on the course descriptions, software development courses involving building user interfaces did not emphasise or contain much material on UI and service design. It would probably be beneficial to include some basic learning outcomes on this too to the courses or implement it as a separate independent course.

Practice

- ability to apply norms of engineering practice in their engineering specialisation;
- ability to consult and apply codes of practice and safety regulations in their engineering specialisation

Most of the courses introduce theory during the first lessons. Then students apply the theory in practice by doing exercises during classes and assignments during the course. In some courses, assignments also are provided by companies.

The self-assessment report states that the students learn the good practices of information and communications technology and understand the great responsibility they have from the ethics, safety, and environment perspectives.

Based on the interviews with the external stakeholders as well as the alumni of the degree programme, the accreditation team has the impression that the relevant norms of engineering practice as well as codes of practice and safety regulations can be applied by the students.

It, however, has to be noted, that besides "GDPR" neither the self-evaluation report nor the curriculum presented on the Peppi website explicitly mention relevant norms of engineering (e.g., ISO 27001 and 27002, NIST Cybersecurity Framework) or safety concepts (e.g., dependability, availability, reliability).

Investigations and information retrieval

- ability to conduct searches of literature, to consult and to critically use scientific databases and other appropriate sources of information, and to carry out simulation and analysis, in order to pursue detailed investigations and research of technical issues
- ability and practical skills to design and conduct experimental investigations, interpret data and draw conclusions
- ability to work in a laboratory/workshop setting

Although the degree programme does not contain a course focusing specifically on information retrieval, the students confirmed that they do not have problems with finding information and that they get enough support from the teachers during the courses when necessary. The investigation and information retrieval learning outcomes are gathered throughout the studies in ten mandatory courses (43 ECTS). The self-assessment report states that every course has at least a small part of information retrieval and investigation in it, e.g., searching for current solutions. The research can comprise literature searches and interpretation of information from, e.g., programming language specific documentation of used libraries and their functions/methods.

There is a mandatory module for the bachelor's thesis where students have to do different courses that help them to design and conduct experimental investigations, interpret data and draw conclusions: Research and Development; Bachelor's Thesis, Planning; Bachelor's Thesis, Thesis Writing; Bachelor's Thesis, Implementation; Bachelor's Thesis, Reporting and Assessment.

According to the assessment criteria for thesis work, as presented in the evidence room, all passed theses describe the information retrieval process. As going through the theses presented as well in the evidence room, it was noted that in grade 1-3 theses students were able to conduct literature searches but lacking critical selection of used information. In grade 4-5 theses the ability

to conduct searches for information was very well observable. It is very typical for engineering students that focus and ability is on designing and conducting practical investigations. In many cases, the theses are very well connected to working life or other practical setting.

Multidisciplinary competences

- awareness of the wider multidisciplinary context of engineering
- awareness of societal, health and safety, environmental, economic and industrial implications of engineering practice and recognition of the constraints that they pose
- awareness of economic, organisational and managerial issues (such as project management, risk and change management) in the industrial and business context
- ability to gather and interpret relevant data and handle complexity to inform judgements that include reflection on relevant social and ethical issues;
- ability to manage complex technical or professional activities or projects, taking responsibility for decision making
- ability to recognise the need for and to engage in independent life-long learning
- ability to follow developments in science and technology

Multidisciplinary competences are learned in, e.g., Jamk InnoFlash while working in a multidisciplinary group, including ethical competences. The Future Factory project (10 ECTS) and Project Management and Practices courses continues building this awareness on managerial, organisational, and economic issues and increasing the ability to manage more complex technical projects and taking responsibility for decision making. Also, multidisciplinary skills are in focus when studying languages with students from different degree programmes at Jamk. However, it was not found how the awareness of societal, health and safety and implications of engineering practice are covered in the degree programme.

According to stakeholder and alumni interviews, the soft skills of the alumni are good, and they are ready to work in a multidisciplinary context. So, they have in general awareness of the wider multidisciplinary context of engineering. It was evident that the graduates are able manage complex technical and professional projects.

Communication and team-working

- ability to communicate effectively information, ideas, problems and solutions with the engineering community
- ability to communicate effectively information, ideas, problems and solutions with the society at large;
- ability to function effectively in a national and an international context;
- ability to function effectively as an individual and as a member of a team;
- ability to cooperate effectively with engineers and non-engineers.

All Jamk degree programmes contain a 3 ECTS course on Communication Skills which provides the students with knowledge of communication models and understanding of different situations and ways of communication.

Building upon this, teamwork and presentations are part of different modules throughout the studies. As it says on the website of the degree and as the accreditation team was able to check: "The studies include plenty of teamwork projects, as do many workplaces in the field. After graduating from these practical studies, you will have the competence to work in ICT tasks for international organizations".

One notable feature of the degree program is its mandatory courses in English and Swedish. These language courses are specifically designed to equip students with the language skills needed to succeed in working life.

As an ICT engineer, graduates will need expertise in both verbal and written communications, as communication skills are important for various customer projects. The students' verbal language skills will improve in voluntary student exchange, projects, and various exercises conducted during the studies.

Based on the team's assessment, the programme meets standard 8 fully.

Strengths, good practices and areas for further development regarding section 2.2: implementation of teaching and learning

The team notes the following strengths and good practices in this section:

- The degree programme was recommended by the students, alumni and employers, which is a very strong indicator of enabling students to achieve the course and programme learning outcomes.
- In general, the degree programme has strongly emphasized their input on e-learning possibilities and multi-faceted learning environments. There is also an emphasis on using new online learning environments.
- Up-to-date practical assignment methods and industry relevant projects (e.g., the Future Factory course) are deployed that allow students to learn new skills, apply learned skills in practice and to develop good soft skills.
- Outstanding laboratory environments based on experiences gained from R&D projects are available.
- The learning process of students is actively monitored by effective tools and feedback of students matters.
- Support courses for students facing difficulties in mathematics and basic sciences are available.

The team sees the following as areas for further development in this section:

- There is a need to include awareness of the societal, health and safety and implications of engineering practice in the degree programme.
- The basic concepts of designing systems in the commercially available cloud platforms and UI design could be integrated into the programme.
- Opportunities for face-to-face interaction between students and lecturers especially in basic sciences and mathematics courses could be provided.
- International exchange for lecturers as well as students could be strengthened.

2.3 Resources

<table>
<tr><td>Standard 9</td><td>The academic staff are sufficient in number and qualification to enable students to achieve the programme learning outcomes. There are arrangements in place to keep the pedagogical and professional competence of the academic staff up to date.</td></tr>
</table>

According to the self-evaluation report, the total number of staff members in the Institute of Information Technology was 76 in the end of 2022, the academic part consisting of 3 principal lecturers and 27 lecturers and teachers. Additionally, 11 LinkedIn profiles and 5 additional CVs and a document mentioning 40 IT staff and teachers (2 doctor, 4 licentiate, 31 master's degree level, 3 bachelor's degree) were accessible in the digital evidence room. The institute has around 791 students, giving a student-teacher ratio of around 20 and typically around 20 to 30-35 students per group/class, which is acceptable in terms of quantity. Additionally, teachers from other institutes are involved in the degree programme under review (e.g., from physics or language institute / department).

Resource planning of the staff is performed on an annual basis based on the individual expertise of staff members. This results in uneven responsibility for the teachers regarding the programme. While some have only one or two courses, others teach a big number of courses. Many staff members of the degree programme also work in R&D projects and/or business services, which in turn gives feedback for programme development and the laboratories dedicated to education. According to the provided information as well as the discussions during the site visit, the academic team is also qualitatively adequate for the achievement of the programme outcomes of the students.

Teaching staff are appointed according to pre-defined recruitment criteria. In educational jobs, the competence requirements defined in the UAS Act (1 129/2014) as well as the requirements of Jamk's guiding principles are followed. The latter cover, e.g., required degree and pedagogical qualifications for senior or principal lecturers.

Jamk offers various opportunities to the teaching staff to improve their teaching skills and the use of new technologies to keep their competences up to date. On the one hand, a career path where teaching staff can do their PhD at the University of Jyväskylä while teaching and working on R&D at Jamk is offered. Especially R&D projects (e.g., on cybersecurity) provide teachers with the possibility to exchange knowledge with R&D people and companies and keep up with the latest development in their fields. On the other hand, 40h / year are reserved during resource planning for each staff member to keep their competences up to date.

Discussions came up during the site visit regarding resources, which have been dropped in the whole country compared to the situation 5 years ago and there are missing financial resources. Anyway, in the degree programme under review, there have not been changes on the calculation of the teaching resources for the courses. The teaching staff feels that there is not enough time and resources to keep their competences up to date, while on the other hand the possibilities to adapt workload are rarely used and there is an annual quota of 40 hours reserved for the teaching staff members for the competence development. It has to be noted that the COVID pandemic has clearly resulted in an excessive workload on the teacher's side regarding preparation of online courses. This might have influenced the overall feeling. Of note, the academic staff has been described as "amazing and helpful" over the last years and the accreditation team respects their high motivation. Care has to be taken to give more time to the teachers to guide students.

Based on the team's assessment, the programme meets standard 9 fully.

The support staff of the Institute of Information Technology consists of 9 laboratory and project engineers, 1 student affairs coordinator, 1 infrastructure team leader, 1 programme coordinator and the director. The comprehensive support services (HR services, library, quality management, marketing, financial services, ICT services, facility services) offered to the degree programmes are numerous and competent in Jamk. Additionally, student services, educational development services and international services are available in the degree programmes. Further decentralized support services located at the schools such as study counsellors, education secretaries, laboratory staff and e-learning designers assist in this.

As examples, the senior administrative planner of the School of Technology takes care of the quality system, the career tutor acts as career teacher, the study affairs coordinator assists in enrolment to the study environment, the international relations planner assists in international applications, the study counsellor assists students, the information specialist guides students to find information in the studies and the ICT system specialist supports staff and students at the helpdesk.

Staff are supported to keep their competences up to date by. e.g., learning at work and by participating in teaching, RDI and business services. Additionally, continuing education and participation in seminars and conferences in their respective fields is possible. In recent years the development of ICT competences and the digitalization of work have been covered. Pedagogical competences can be trained in the Jamk School of Professional Teacher Education.

The site visit revealed no negative feedback or complaints about IT or library services. The support staff has good connections to the teaching staff.

The following minor aspects have been discussed: students sometimes complain about too many different information systems. In addition, the Covid pandemic ended most of the international activities. Since COVID also had a major impact on students mental as well as physical health and ability to achieve the learning outcomes, a second study counsellor will be employed.

Based on the team's assessment, the programme meets standard 10 fully.

Student Services is a key figure in providing Jamk level support and guidance to students, serving as the first point of contact for guidance on studies, information on services, and study certificates. Additionally, there are centralized support services available for ICT-related issues, as well as for psychological and health problems. The head of the programme helps students with practical training-related issues.

The development of students' well-being at Jamk is the responsibility of a multidisciplinary well-being team, which also has experts from outside Jamk as its members. There are guidelines ensuring that an accessible study environment and student health care services are available to the students. Student associations provide sports and leisure-time activities for all Jamk students.

Each student has a designated career tutor. These tutors help students become familiar with university studies and monitor their progress throughout their studies. The career tutors meet with the students every academic year during the studies to discuss their academic progress. If necessary, the career tutors are assisted by the study counsellor, the programme coordinator and/or the head of department. As to the progress of the thesis, it is monitored by the thesis supervisors. Student services help students with enrolments, study entitlement, and the overall smoothness of studies as well as matters related to graduation. These services are available online.

The personal learning and career plan (PLP) is a mandatory assignment for the student in the course Development as an Expert. The PLP is based on the structure of studies described in the curriculum of the year of admission and on each year's course offering. The students update their learning plans as their studies progress and their personal career plans develop. The PLP helps students, teachers, career tutors, and programme coordinators to monitor and guide each student's individual learning and development needs. The PLP and the career plan are updated in the PLP discussion held with the career tutor annually. Students bear the responsibility for completing and monitoring their studies, but student counselling support is available throughout their studies.

Study counselling at Jamk and the degree programme under review is a collaborative effort, with other staff members such as programme coordinators and supervisors also contributing to the process. Based on interviews, it appears that students value career tutoring as well as guidance and services in general and find them to be effective.

Based on the team's assessment, the programme meets standard 11 fully.

Standard 12 The classrooms, computing facilities, software, laboratories, workshops, libraries and associated equipment and services are sufficient and accessible to enable students to achieve the programme learning outcomes.

The degree programme has a modern campus located in the Lutakko district near the centre of Jyväskylä. Classrooms, workspaces and laboratory facilities are well equipped and support both education and RDI. In addition to formal learning spaces, Jamk also provides a more informal space called "Relaamo" for students to come together to study, work on school projects, socialize and provide peer support. A helpdesk for students is available on the main campus as well as online.

The student library is located in the main school building and provides computers, books, journals and access to relevant online learning and research resources. In the recent years, the trend has been a move from traditional printed books and journals towards electronic versions which are also usable by the staff and students off-campus. The collection of both printed and electronic materials is regularly updated, and the library tries to acquire materials requested by their customers.

The staff is provided with their own computers and the students have access of several computer classes on campus or can bring their own devices that they can connect to Jamk's WIFI-network. The basic ICT-infrastructure is maintained by the support staff and computers are kept up to date on a 3—4-year cycle. Students are provided the essential office software as well as email and other relevant software services through a Microsoft O365 subscription. Students also have other relevant software licences available for their studies.

There is dedicated infrastructure support staff maintaining and developing different learning laboratory environments. The most important of these are called LabraNet, Virtual Learning Environment (VLE), Physics laboratory, and Data Network laboratory.

An interesting Jamk speciality is the Realistic Global Cyber Environment (RGCE), which is a Cyber Range for research, development, training, and exercise. Lessons learned from the building of the RGCE have been utilized when building specific IT laboratory environments for the students (such as the Virtual Learning Environment).

Based on the team's assessment, the programme meets standard 12 fully.

Standard 13 The HEI and the programme have external partnerships that are adequate to the achievement of the programme learning outcomes.

Jamk has a strong presence especially in the region of Central Finland and numerous partnerships with local enterprises, educational institutions and other external stakeholders. Jamk has an active and extensive collaboration with major ICT companies located in the region and students are often involved in projects that fulfil a real existing business need of some of the companies in the WIMMA Lab and Future Factory courses and often are picked for internship and thesis work from these projects to relevant companies. Jamk has also maintained a relationship with many alumni who now work in different companies in the area and provide both internships and employment to students. The partnership with the largest and most relevant companies is formalized with a partnership agreement and these companies have a large representation in the degree programme Advisory Board.

The Institute of Information Technology is actively participating in different research and development initiatives covering multiple fields such as data networks, software development, electrical engineering, and cyber security. The Institute has currently 3 RDIs ongoing at the local level, 8 at the national level and two at the international level. Many of the staff members also work in RDIs which provides them an opportunity to widen their expertise and furthermore provides feedback to the development of the programme curriculum and laboratory environments. It should be noted that the programme's cyber security specialization got its start from the JYVSECTEC cyber security RDI.

Jamk participates in the EduFutura Jyväskylä network that connects the Jyväskylä Educational Consortium Gradia, the Jyväskylä educational municipality association, the University of Jyväskylä and Jamk.

Jamk has close co-operation with a number of international HEIs. Activities with King Mongkut's University of Technology Thonburi (KMUTT) in Thailand have been on-going since 2003 which have included student, teacher and staff mobility, knowledge sharing on curricula development and implementing new teaching methods. Co-operation with Takasaki University of Health and Welfare (TUHW) in Japan has been active since 2014 and is progressing to the area of joint diploma education. The French graduate school Junia and Jamk started co-operation on one semester diploma education for students.

Covid stopped international student mobility programs and after the pandemic the interest from students has not been very high for student exchange. Jamk is encouraged to find ways to grow this activity back to pre-pandemic levels since international co-operation and skills to work in a multicultural working environment are of increasing demand among companies hiring people to different ICT roles.

Based on the team's assessment, the programme meets standard 13 fully.

Jamk´s funding is mainly dependent on The Ministry of Education and Culture of Finland. The financing is based on the results achieved and the new financing model has been running since 2021, where 76% of funding is based on education, 19% on research and development and 5% on other education and R&D policy considerations. Jamk has also other sources of income such as further education and service operations.

According to the self-assessment report and interviews, Jamk has sufficient financial resources to implement the learning process as planned in the degree programme under review. It was not fully clear how financial resources are allocated to degree programmes. The budgeting system in use does not provide an exact state of the financial resources devoted to this degree programme. The degree programme under review is encouraged to further clarify its budgeting and budget monitoring practises and to ensure appropriate financial resources both from public and external sources.

Based on the team's assessment, the programme meets standard 14 fully.

Strengths, good practices and areas for further development regarding section 2.3: resources

The team notes the following strengths and good practices in this section:

- The academic as well as technical and administrative staff are competent, well-motivated and devoted.
- Tight and mutually beneficial partnerships with major local stakeholders in the area as well as active external partnerships at the local, national, and international level are maintained.
- Jamk has a strong local presence in the Central Finland region.
- There are very good opportunities for the teaching staff to improve their teaching skills and actively develop their knowledge and skills and the use of new technologies and the latest industry trends.

The team sees the following as areas for further development in this section:

- To keep up the good student guidance and teaching, it would be advisable to give more time to the teachers to guide students.
- Overall, there is need to ensure that there are sufficient resources to tackle future challenges, both with students' behavioural changes and teachers' workload.
- There is need to increase enthusiasm in the student population for international exchange programs.

2.4 Quality management

Jamk has clearly defined quality management processes and responsibilities outlined in the Jamk Quality Manual. The principles of quality management are outlined as follows at the level of the whole institution:

- Promoting quality at Jamk University of Applied Sciences,
- Improving work and results continuously and renewing our ways of operating, and
- Strengthening a quality culture that involves the members of the academic community and external interest groups.

The Jamk Quality Team is responsible for maintaining the quality system's procedures. The Jamk Management Team has the responsibility of addressing current quality issues in their meetings. The quality system is also externally audited every six years with an internal audit mid-cycle. Each of the four schools in Jamk have their own dedicated quality officers with the responsibility of ensuring the functioning of the quality system in their school. The quality system also engages the personnel, students, the student union and Jamk's board of examiners.

Jamk perceives that the audits by the Finnish Education Evaluation Centre (FINEEC) in 2006, 2013 and 2019 are part of their quality culture that has been systematically built since the early 90's.

The Jamk quality system mandates that feedback is collected from students both mid-course and at the end of the course. This is implemented with the Peppi system automatically sending feedback forms for the students or asking the students to fill in a handwritten form. The general feedback from students has been very positive. However, the response rate for the student feedback is generally very low and makes it hard to ascertain whether the sample is representative.

The quality management procedures of the degree programme are consistent with the quality policy. It would be advisable for Jamk to come up with some corrective actions to improve the response rate of feedback and gain more reliable feedback from students.

Based on the team's assessment, the programme meets standard 15 fully.

Standard 16 The organisation and decision-making processes of the programme are fit for effective management.

Jamk has a "Rules of Procedure" that define the school director's responsibilities in

- implementing the strategy of the university of applied sciences in their school
- quality and productiveness of education, RDI activities and service business
- leading co-operation between the university of applied sciences and the business life and public government

The programme operates under the School of Technology in its own Institute of Information Technology and have their own directors who operate under the school director. The Management Team of the school includes the school director, institute heads, an administrative planner and a representative of the personnel. The team has monthly meetings.

Each degree programme has a leader of higher education responsible for the structure and coordination of the programme and a programme coordinator.

Jamk involves the institute's Advisory Board as well as the Student Affairs Board in the revisions of the degree programme curricula.

The decision-making process is effective clearly defined at the degree programme level.

Based on the team's assessment, the programme meets standard 16 fully.

Standard 17	The programme reviews and develops the programme aims, curriculum, teaching and learning process, resources and partnerships and quality management in a systematic and regular manner, taking into account analysis of results of student admissions, students' study progress, achieved learning levels, student, graduate and employer feedback and graduate's employment data.

The degree programme is planned as defined in the Jamk strategy and according needs of the ICT industry. There is a process description in the Jamk process manual regarding preparing and approving curricula for the degree programmes. According to the self-evaluation report, the degree programme follows continuous improvement principles. The curriculum is planned yearly and modified by the programme coordinator and accepted by the Board of Student Affairs. The feedback and opinions of different industry partners (partnerships, Advisory Board) and other stakeholders (university partners, EduFutura, international networks) are taken on account.

The teaching methods, learning environments and content of courses is assessed via course and student feedback. Mid-term feedback is gathered regularly. However, it was obvious that the feedback system included in Peppi is not very popular among students and Jamk should consider some means to improve the percentage of given feedback, which is also noted in the self-evaluation report. Nationally gathered AVOP feedback from graduates is on a good level and each year the student feedback week gives more insight into teaching methods. There is also an interactive discussion possibility for students with the head of education, where improvement suggestions and questions are jointly discussed. Students' overall feedback regarding teaching is positive, and teachers are considered to reply very quickly when contacted. The career monitoring survey gathers data about employment. The latest bigger reform to the curriculum was made 2019-20.

Student admission statistics are found openly in the Finnish electronic Vipunen portal, and it shows a quite stable number of applicants and attraction numbers within the last five years. Jamk and the degree programme under review have done data analysis regarding the correlation of study success with admission success and how the outcomes of the courses relate to possible drop-out. Study progress is followed with help of the Peppi system and supported by Power BI reports for collective and individual student performance. The drop-out rates are high in ICT, which is a general issue in Finland, and around 65% of students will complete the degree. The COVID pandemic has had negative impact on this as well. Also, some students go to work without ever graduating. On the course level, the progress of the students is followed by the submission of tasks and teachers can reach out to those who have not submitted their tasks on time. Study

counsellors also follow the progress of studies and offer support, if needed. Speeding up graduation and reducing the number of dropouts has been pointed out by Jamk as one area that needs development. This will be supported soon by hiring a second study counsellor.

The Jamk quality system uses daily improvement and follow-up and evaluation procedures such as feedback information, evaluations and other indicators. A systematically functioning quality organisation has clear functions and tasks and follows the Quality Manual as well as the Jamk process manual. Periodic internal evaluation once every six years ensures regular review of the degree programme.

Based on the team's assessment, the programme meets standard 17 fully.

> **Standard 18** The programme provides public, up to date information about its objectives, teaching and learning process, resources, quality management procedures and results.

Jamk provides detailed and accurate information about the degree programme on its website. The curriculum is publicly available and contains information about the programme's objectives and teaching methods. However, there is room for improvement in providing more detailed information at the course level.

Jamk also publishes information about its quality management and results on its website, particularly in the section on quality. However, it may be challenging for the general public to find quantitative and qualitative data related to the program's performance. The accreditation team recommends that the degree programme consider making this information more easily accessible and determine which specific results would be the most useful to publish or link to on its website. This recommendation was already made in the last report. Since Jamk aims to be a strongly internationally oriented higher education institution, it is highly recommended to increase the level of information provided in English on all the educational provision. Currently, for readers outside of Finland, the information provided on the degree programme under review is limited to the curriculum. However, it has to be noted also, that for Finnish speaking applicants and students there is a lot of information available along with possible career paths. As a summary, the accreditation team recommends for Jamk and the degree programme to enhance the availability of information concerning degree level results as well as the availability of information in English.

Based on the team's assessment, the programme meets standard 18 fully.

> **Strengths, good practice and areas for further development regarding section 2.4: quality management**

The team notes the following strengths and good practices in this section:

- Jamk has clearly defined quality management processes and the degree programme actively uses ways to gather feedback.
- Various quality instruments are implemented, which allow monitoring students' study progress in multiple ways. They provide insights into the number of graduates, students' progress, and dropout rates.
- The decisionmaking process is clearly defined and effective.

The team sees the following as areas for further development in this section:

- The percentage of given feedback from courses could be improved by implementing feedback as a mandatory part of the course.
- Information about Jamk's quality management and results could be improved by making it more easily accessible on its website.

Overall evaluation of the degree programme

3

Upon reviewing the degree programme, the team highlights the following **key strengths and good practices**:

- Jamk has a very strong quality culture, which is seen as part of their image and reputation. This also reflects the overall good quality of the degree programme under review.
- The degree programme has an up-to-date curriculum with specialisation areas allowing students to excellently prepare for working life.
- Jamk and the degree programme have very good industry cooperation.
- The implementation of teaching and learning as well as the integration of R&D work well.
- The personal learning plan (PLP) allows students to graduate as quickly and efficiently as possible.
- Good working conditions allow the highly motivated staff to perform their tasks in the degree programme well.
- The continuous learning and career development of teaching staff is supported.

The team sees the following as the **main areas for further development** of the degree programme:

- Overall, sufficient resources should be provided the degree programme to tackle future challenges, both with students' behavioural changes after COVID pandemic as well as teachers' workload.
- The degree programme needs to describe and publicly document the typical and/or recommended study paths within the degree programme for the applicants, students and the wider public. Furthermore, there should be a procedure in place for ensuring that all the study paths allow achieving the intended programme outcomes.
- To keep up the good student guidance and teaching, it would be advisable to give more time to the teachers to guide students.
- Corrective actions should be taken to get more reliable and comprehensive feedback from students.

The accreditation team recommends that the degree programme is *accredited with the following conditions*:

- The degree programme needs to describe and publicly document the typical and/or recommended study paths within the degree programme for the applicants, students and a wider audience. Furthermore, there should be a procedure in place for ensuring that all the study paths allow to achieve the intended programme outcomes and the course learning outcomes of the modules aggregate to the programme outcomes (standard 3).

FINEEC Committee for Engineering Education's Decision

4

In its meeting on 9 June 2023 the FINEEC Committee for Engineering Education decided, based on the proposal and report of the accreditation team, that the Degree Programme in ICT at Jamk University of Applied Sciences (instruction is Finnish, full-time and part-time implementations) is accredited conditionally. The set conditions are those listed in section 3.

This decision also covers the Degree programme in ICT (instruction in English) at Jamk University of Applied Sciences.

The accreditation is valid until 9 June 2024 by which Jamk University of Applied Sciences should report to the Finnish Education Evaluation Centre (FINEEC) on how they have met the set conditions.

If the FINEEC Committee for Engineering Education then finds that the conditions have been successfully met, the validity of the accreditation will be extended until 9 June 2029.

E ngineering programme accreditation is a degree programme specific evaluation that can lead to the European EUR-ACE® Label. The accreditation aims to support the enhancement of quality in engineering degree programmes and increase the international comparability and recognition of engineering degrees within Europe. The accreditation is voluntary for Finnish higher education institutions and degree programmes. This report presents the process and results of the accreditation of the Degree Programme in ICT at Jamk University of Applied Sciences in Finland.

The Finnish Education Evaluation Centre (FINEEC) is an independent agency responsible for the evaluation of education. It operates as a separate unit within the Finnish National Agency for Education. It implements system and thematic evaluations, learning outcome evaluations and field-specific evaluations. Moreover, FINEEC supports providers of education and training and higher education institutions in matters related to evaluation and quality assurance, as well as advances the evaluation of education.