Competence objectives

Engineering education is of European and Finnish level 6 (National reference framework).

Competence area	Competence at level 6
Knowledge	Has a good command of comprehensive and advanced knowledge of his/her field, involving a critical understanding and appraisal of theories, key concepts, methods and principles. Understands the extent and boundaries of professional functions and/or disciplines.
Skills and application	Has advanced cognitive and practical skills, demonstrating mastery of the issues and the ability to apply knowledge and find creative solutions and applications required in a specialised professional, scientific or artistic field to solve complex or unpredictable problems.
Responsibility, Management and Entrepreneurship	Works independently in expert tasks of the field and in international co-operation or as an entrepreneur. Manages complex professional activities or projects. Can make decisions in unpredictable operating environments.
Evaluation	In addition to evaluating and developing his/her own competence, he/she takes responsibility for the development of individuals and groups.
Self-develoment and Lifelong Learning	Has the ability for lifelong learning. Considers communal and ethical aspects when dealing with different people in learning and working communities and other groups and networks. Communicates to a good standard verbally and in writing in his/her mother tongue both to audiences in the field and outside it. Communicates and interacts in the second national language and is capable of international communication and interaction in his/her field in at least one foreign language.

Competencies

The competence profile of an IoT Engineer consists of general and degree-specific competencies. For the general competencies, Savonia University of Applied Sciences follows the recommendations of Arene (the Rectors' Conference of Finnish Universitites of Applied Sciences).

Generic competences	Description of the competence at level 6
Learning to learn	The graduating student recognises the strengths and development areas of their competence and learning methods, and they utilise the opportuni-ties communities and digitalisation provide in their learning. • Assesses and develops their compe-tence and learning methods in different learning environments. • Is able to acquire, critically assess and appropriately apply the national and international knowledge base and practices of their field. • Also takes responsibility for group learning and sharing what has been learned.
Operating in a workplace	The graduating student has versatile working life skills and is able to operate in work communities of their field. • Is able to work constructively in a work community and promotes their own and their work community's well-being. • Is able to act professionally in communication and interaction situations at a workplace. • Utilises the opportunities offered by technology and digitalisation in their work. • Understands the complexity of changing working life and their own resilience in changing working life situations. • Has capabilities for an entrepreneurial approach.
Ethics	The graduating student adheres to the ethical principles and values of their field of profession, taking the principles of equality and non-discrimination into account. • Is able to take responsibility for their own actions and their consequences and reflects on them in accordance with the ethical principles and values of their field. • Takes others into account and pro-motes equality and non-discrimination. • Take into account the realisation of diversity and accessibility in their actions.

	• Understands the principles of respon-sible conduct of research and adheres to them. • Is able to influence society based on ethical values.
Sustainable development	The graduating student is familiar with the principles of sustainable development, promotes their implementation and acts responsibly as a professional and a member of society. • Is able to use information related to their field in finding, implementing and establishing sustainable solutions and operating models. • Understands sustainability challenges, their interdependencies and the various aspects of issues and problems.
Internationality and multiculturalism	The graduating student is able to operate in multicultural and international operating environments and networks. • Is familiar with the impacts of their cultural background on their activities and is able to develop operating methods that take multiculturalism into account in their work community. • Is able to monitor and utilise the international development of their field in their work. • Is able to communicate internationally in their work tasks.
Proactive development	The graduating student is able to develop solutions that anticipate the future of their own field, applying existing knowledge and research and development methods. • Solves problem situations creatively and reforms operating methods together with others. • Is able to work in projects in cooperation with actors of different fields. • Is able to apply existing knowledge in the field in development and utilises re-search and development methods. • Is able to seek customer-oriented, sustainable and economically viable solutions, anticipating the future of their field.

Specific competences of IoT Engineering	Description of the competence
Mathematics and Physics	• Is able to apply mathematical methods and tools to describe the phenomena of the field and to solve problems • Is familiar with the essential physical laws used in the technical applications, especially regarding the field of sensors and electrical engineering
Sensors	• Is familiar with sensor types and understands their functions • Is able to select suitable sensors for each application
Electronics	• Is familiar with electronic components and understands their functions • Masters basics of analog and digital circuit design
Embedded computing	• Is familiar with microcontrollers and embedded computers and understands their functions • Masters basics of embedded programming
Networks	• Is familiar with wired and wireless networks • Is able to design and create computer networks
Cybersecurity	• Understands role of cybersecurity in IoT industry • Is able to define systems with good cybersecurity
Edge Computing	• Knows the methods of edge computing • Is able to define suitable edge computing configuration for each application
Cloud Computing	• Knows the methods of cloud computing • Is able to define suitable cloud computing methods for each applications
Data analysis and artificial intelligence	• Knows the principles of data analysis and artificial intelligence • Is able to apply different data analysis and artificial intelligence methods in embedded, edge and cloud computing
IoT ecosystem and applications	• Masters IoT ecosystem principles • Is able to select and deploy relevant IoT hierarchy for different applications.
Product development	• Knows the methods and tools of product development • Is able to select technology for IoT system • Is able to produce standardized documentation • Is familiar with the quality system of products and production • Understands the product life cycle

Specific competences of IoT Embedded Engineering	Description of the competence
Advanced electronics	• Masters advanced analog electronics • Is able to define analog circuits for IoT
Advance embedded programming	• Masters advanced embedded programming of microcontrollers • Is familiar with real-time programming of microcontrollers

Specific competences of IoT Cloud Engineering	Description of the competence
Big Data and Business Intelligence	• Knows basics of Big Data and Business Intelligence methods • Is able to select suitable Big Data processing and visualization tools
Cloud computing	• Masters basics of cloud services • Is able to deploy cloud computing services and connect them with IoT devices