

**Curriculum at LAB University of Applied Sciences  
2023-2024**

**Bachelor of Engineering, Information and Communications  
Technology 23K, part-time studies, Lahti**

Code	Name	1 y	2 y	3 y	4 y	ECTS total
<b>TLTITVT23KM-1001 CORE COMPETENCE</b>						<b>195</b>
<b>TLTITVT23KM-1002 Common Core Competence</b>						<b>15</b>
A300CE13	Orientation to Sustainability Thinking		2			2
AY00BU56	Developing professional competence 1	1				1
AY00BU57	Developing professional competence 2	1				1
AY00BU58	Developing professional competence 3		1			1
KS00BT59	Expert Communication Skills	4				4
KE00BT61	English for Work	4				4
KR00BU42	Swedish for Work, Spoken		1			1
KR00BU43	Swedish for Work, Written		1			1
<b>TLTITVT23KM-1003 Professional Core Competence</b>						<b>180</b>
<b>TLTITVT23KM-1004 Common Professional Core Competence</b>						<b>75</b>
<b>TLTITVT23KM-1005 Basic studies in mathematics and physics</b>						<b>15</b>
AT00BT67	Basic studies in mathematics	3				3
AT00BT68	Mathematics in Technology 1	3				3
AT00BT69	Mathematics in Technology 2		3			3
AT00BT70	Basic studies in physics	3				3
AT00BT71	Physics in Information Technologies	3				3
<b>TLTITVT23KM-1006 Digitalization</b>						<b>15</b>
AT00BT72	Basics of Digitalization	5				5
AT00BT73	STEM of ICT	5				5
AT00BT74	IoT Basics		5			5
<b>TLTITVT23KM-1007 Basic of ICT</b>						<b>15</b>
AT00BT75	Basics of Programming	5				5
AT00BT76	Basics of WWW design	5				5
AT00BT77	Telecommunications and security basics	5				5
<b>TLTITVT23KM-1008 ICT and applications</b>						<b>15</b>
AT00BT78	Objects and databases	5				5
AT00BT79	Web and interactivity	3				3
AT00BT80	Server and workstation virtualization	4				4
AT00BT81	Basics of Project work	3				3

<b>TLTITVT23KM-1009 RDI and entrepreneurship</b>				<b>15</b>
AT00BY44	Research Seminar	5		5
AT00BY45	Entrepreneurship and Innovation	5		5
AT00BY46	Working Skills	5		5
<b>TLTITVT23KM-1010 Profiling Professional Core Competence</b>				<b>60</b>
<b>TLTITVT23KM-1011 Web and game technologies</b>				<b>15</b>
AT00BX89	Web and Game technologies basics	5		5
AT00BX90	Web and Game design	5		5
AT00BX91	Application of web and game technologies	5		5
<b>TLTITVT23KM-1012 IoT and embedded systems</b>				<b>15</b>
AT00BX92	IoT and embedded systems basics	5		5
AT00BY05	IoT and embedded systems design	5		5
AT00BY06	Applications of IoT and embedded systems	5		5
<b>TLTITVT23KM-1013 Software engineering</b>				<b>15</b>
AT00BY07	Software engineering and architecture	5		5
AT00BY08	Data structures and algorithms	3		3
AT00BY09	Programming languages	4		4
AT00BY10	Software maintenance and testing	3		3
<b>TLTITVT23KM-1014 Tele communication</b>				<b>15</b>
AT00BY11	LAN basics and security	5		5
AT00BY12	Network monitoring and redundancy	5		5
AT00BY13	Client-driven data networks	5		5
<b>TLTITVT23KM-1015 Media technology</b>				<b>15</b>
AT00BY14	Modelling	5		5
AT00BY15	Game design basics	5		5
AT00BY16	Audiovisual technologies	5		5
<b>TLTITVT23KM-1016 Digital technology</b>				<b>15</b>
AT00BY17	Embedded computers	5		5
AT00BY18	Electronics	5		5
AT00BY19	Digital technologies workshop	5		5
<b>TLTITVT23KM-1017 Web services</b>				<b>15</b>
AT00BY20	Javascript platforms		4	4
AT00BY21	Server technologies		4	4
AT00BY22	Frameworks		3	3
AT00BY23	Cloud computing		4	4
<b>TLTITVT23KM-1018 Mobile and game programming</b>				<b>15</b>
AT00BY24	Hybrid mobile programming		5	5
AT00BY25	Native mobile programming		5	5
AT00BY26	Advanced game programming		5	5
<b>TLTITVT23KM-1019 Visual design</b>				<b>15</b>

AT00BY27	User Interfaces and usability			5		5
AT00BY28	Web game environments			5		5
AT00BY29	Graphics communication			5		5
<b>TLTITVT23KM-1020 Game technology</b>						<b>15</b>
AT00BY30	Game modelling			5		5
AT00BY26	Advanced game programming			5		5
AT00BY32	New technologies			5		5
<b>TLTITVT23KM-1021 Data centers and server systems</b>						<b>15</b>
AT00BY33	Virtualization and Cloud services			5		5
AT00BY34	Servers and services			5		5
AT00BY35	Implementation of the service			5		5
<b>TLTITVT23KM-1022 Embedded programming</b>						<b>15</b>
AT00BY36	Basics of embedded programming			5		5
AT00BY37	Distributed Systems			5		5
AT00BY38	Applications of IoT			5		5
<b>TLTITVT23KM-1023 IoT systems and solutions</b>						<b>15</b>
AT00BY50	IoT development environments and systems			5		5
AT00BY51	IoT communication systems and monitoring			5		5
AT00BY52	IoT service client project			5		5
<b>TLTITVT23KM-1024 Embedded devices</b>						<b>15</b>
AT00BY39	IoT devices			5		5
AT00BY40	IoT and data transfer			5		5
AT00BY41	IoT Workshop			5		5
<b>TLTITVT23KM-1025 Practical Training</b>						<b>30</b>
HA00BU59	Practical Training 1	1,5	3	3	3	10
HA00BU60	Practical Training 2		2	4	4	10
HA00BU61	Practical Training 3			3,5	6,5	10
<b>TLTITVT23KM-1026 Thesis</b>						<b>15</b>
AO00BU62	Thesis Planning			2,5	2,5	5
AO00BU63	Thesis Project				5	5
AO00BU64	Thesis Report				5	5
<b>TLTITVT23KM-1027 COMPLEMENTARY COMPETENCE</b>						<b>45</b>
<b>TLTITVT23KM-1028 From data to machine learning</b>						<b>15</b>
AT00BY42	Data analysis and visualization				10	10
AT00BY43	Machine Learning				5	5

**TLTITVT23KM-1001 CORE COMPETENCE: 195 ECTS**

**TLTITVT23KM-1002 Common Core Competence: 15 ECTS**

## **A300CE13 Orientation to Sustainability Thinking: 2 ECTS**

### **Learning outcomes**

Identify and define central concepts and frameworks related to sustainability. Recognize the interconnectedness of economic, social and environmental sustainability issues. Understand and develop own individual role in driving sustainability.

### **Evaluation criterias**

#### **Level 1**

Pass-Fail

## **AY00BU56 Developing professional competence 1: 1 ECTS**

### **Learning outcomes**

The student is able to

- plan their own learning and cooperate in situations related to their own field of studies
- recognize their own competence and the needs to develop them further and to plan their careerpath observing them
- act as a group member
- operate in the learning environments of LAB University of Applied Sciences
- picture their own field of studies and its future skills- give feedback on tuition and services and thus participate in the development of education

## **AY00BU57 Developing professional competence 2: 1 ECTS**

### **Learning outcomes**

The student is able to

- utilize various learning opportunities in curriculum
- recognize and aim their own competences to be in level with the future career requirements
- create a study plan that supports the future career goal
- give feedback on tuition and services and thus participate in the development of education

## **AY00BU58 Developing professional competence 3: 1 ECTS**

### **Learning outcomes**

The student is able to

- identify themselves as a learner and develop their own learning skills
- evaluate innovative or alternative future competences required in their own field
- recognize and aim their own competences to be in level with the future career requirements
- masters the professional concepts of their own field and is able to point out their competencies during job recruitment processes
- give feedback on tuition and services and thus participate in the development of education

## **KS00BT59 Expert Communication Skills: 4 ECTS**

### **Learning outcomes**

Proficiency level: C2

The student masters Finnish language as a mother tongue in all professional spoken and written communication situations.

### **KE00BT61 English for Work: 4 ECTS**

#### **Learning outcomes**

Proficiency level: B2

The student is able to

- communicate clearly and effectively in different generic and field-specific workplace situations both orally and in writing
- find, evaluate and use information effectively
- function collaboratively in international working environments.

### **KR00BU42 Swedish for Work, Spoken: 1 ECTS**

#### **Learning outcomes**

The student is able to

- convey and validate arguments
- use vital field-specific vocabulary
- communicate essential matters about their education, work experience and tasks
- present their field-specific operational environment
- communicate in various working life situations in Swedish.

The student completes the Public Administration Language Test in Swedish.

### **KR00BU43 Swedish for Work, Written: 1 ECTS**

#### **Learning outcomes**

The student is able to

- use vital field-specific vocabulary
- communicate essential matters about their education, work experience and tasks
- understand and produce various short texts related to studies and working life
- acquire information on their field in Swedish
- use online dictionaries.

The student completes the Public Administration Language Test in Swedish.

### **TLTITVT23KM-1003 Professional Core Competence: 180 ECTS**

### **TLTITVT23KM-1004 Common Professional Core Competence: 75 ECTS**

### **TLTITVT23KM-1005 Basic studies in mathematics and physics: 15 ECTS**

### **AT00BT67 Basic studies in mathematics: 3 ECTS**

**Learning outcomes**

Student is able to

- calculate and simulate mathematical expressions
- solve geometric and trigonometric problems

**AT00BT68 Mathematics in Technology 1: 3 ECTS****Learning outcomes**

Student is able to:

- recognise different polynomial equations and polynomial graph
- solve inequalities
- solve simultaneous equations with the software
- solve basic space vectors
- utilise space vectors
- solve exponential and logarithm functions

**AT00BT69 Mathematics in Technology 2: 3 ECTS****Learning outcomes**

Student is able to

- solve challenging functions
- solve basic derivation functions and utilise derivation in practice
- solve integrated polynomial functions and utilise integration in practice
- solve trigonometrical problems

**AT00BT70 Basic studies in physics: 3 ECTS****Learning outcomes**

Student is able to

- understand the purpose of the physics in technology
- describe and utilize the SI-unit system and implement
- solve mathematical problems in kinematics, mechanics and thermodynamics
- utilize vectors

**AT00BT71 Physics in Information Technologies: 3 ECTS****Learning outcomes**

Student can

- explain thermal transfer methods and utilize them in ICT
- Evaluate wave motion and calculate with wave motion related quantities
- Analyze different ac-signals

**TLTITVT23KM-1006 Digitalization: 15 ECTS****AT00BT72 Basics of Digitalization: 5 ECTS**

**Learning outcomes**

The student is able to

- produce documents (word processing, spreadsheets and presentation) according to the needs of the activity
- configures computer's operating environment and basic settings
- connect a computer to a network and use it with security in mind
- utilize the mathematical operations and representations required in ICT environments

**AT00BT73 STEM of ICT: 5 ECTS****Learning outcomes**

Student can

- basics of electrical engineering and components
- basics of analogue and digital electronics
- utilize basics of statistics and probability in ICT

**AT00BT74 IoT Basics: 5 ECTS****Learning outcomes**

The student is able to

- work in a simple IoT development project
- design and implement a simple embedded IoT device
- explain the basics of the IoT pipeline

**TLTITVT23KM-1007 Basic of ICT: 15 ECTS****AT00BT75 Basics of Programming: 5 ECTS****Learning outcomes**

The student is able to

- choose the appropriate presentation of information in the programs
- use logical operators and program structures in programming
- describe the stages of program development and the principles of program execution
- design and implement a modular interactive application in accordance with good programming practice and with clear source code
- describe the characteristics of object-oriented programming and use objects in programming
- identify the use of programs in different programming languages and platforms

**AT00BT76 Basics of WWW design: 5 ECTS****Learning outcomes**

Student is able to:

- describe meaning of markup languages and how they work in www environment
- describe the most important web protocols
- create and publish responsive web page which is done by using HTML and CSS languages
- use basic techniques of image processing
- utilize images on web pages and documentation

## **AT00BT77 Telecommunications and security basics: 5 ECTS**

### **Learning outcomes**

The student is able to

- explain “how the Internet works” and describe the central services and their effects on the usability of the services provided by the Internet
- explain what components form Local Area Network (LAN) and what factors most affect its capacity and performance
- plan, implement, and test the most used services of a LAN and be able to connect the local area network to the Internet
- explain the functions and differences of a routers and switches and describe the content and structures of packets, frames and other data network messages
- describe and take into account the risks and security threats connected to data communications and explain how a firewall works

## **TLTITVT23KM-1008 ICT and applications: 15 ECTS**

## **AT00BT78 Objects and databases: 5 ECTS**

### **Learning outcomes**

The student is able to

- identify the object paradigm and its basic concepts
- design and implement applications in object-oriented language
- operate effectively in a modern software development environment
- organize the application structure to be maintained
- use files and databases to store application data
- perform database queries and data updates using databases

## **AT00BT79 Web and interactivity: 3 ECTS**

### **Learning outcomes**

A student can:

- utilize JavaScript language to create dynamic web content
- utilize open source JavaScript libraries
- use css-preprocessor in creation and modification of css files

## **AT00BT80 Server and workstation virtualization: 4 ECTS**

### **Learning outcomes**

The student is able to

- utilize their virtualization environment in software testing and in producing digital services.
- explain the strengths and weaknesses of the most common virtualization tools, and understands the differences between having a data center or using a public cloud computing services
- recognize the risks and security threats associated with using a data center or public cloud computing services and explain the most common solutions used to minimize these problems
- plan, implement, and test the implementation and use of a software in a virtualized environment



**AT00BT81 Basics of Project work: 3 ECTS****Learning outcomes**

The student is able to

- describe the models, key concepts and stages of project activities
- document the project according to general practices
- work as a member of the project team

**TLTITVT23KM-1009 RDI and entrepreneurship: 15 ECTS****AT00BY44 Research Seminar: 5 ECTS****Learning outcomes**

The student is able to

- obtain information independently
- do research work using project work methods
- utilize the knowledge and skills gained in a practical project in the research work
- apply research information in practical projects
- write a written report and a seminar presentation
- critically examine professional texts and presentations
- use statistical and probabilistic mathematical methods

**AT00BY45 Entrepreneurship and Innovation: 5 ECTS****Learning outcomes**

The student knows how to:

- describe the foundations of internal, voluntary, and external entrepreneurship
- evaluate the business idea and its chances of success
- assess the strategic importance of innovation and innovation
- use different brainstorming methods
- analyze different innovation processes

**AT00BY46 Working Skills: 5 ECTS****Learning outcomes**

The student is able to

- define most important competences needed in work life
- act as an expert in different jobs
- define future work skills and challenges in work life
- categorize rules in work life
- interpret work life economy, human resources and leadership

**TLTITVT23KM-1010 Profiling Professional Core Competence: 60 ECTS****TLTITVT23KM-1011 Web and game technologies: 15 ECTS**

## **AT00BX89 Web and Game technologies basics: 5 ECTS**

### **Learning outcomes**

The student is able to

- evaluate the impact of network topology and technology on data transmission performance
- utilize LAN services in their own work (DHCP, VLAN, ARP)
- master the basics and maintaining of operating systems (Linux / Windows)
- explain the basic structures of a web application

## **AT00BX90 Web and Game design: 5 ECTS**

### **Learning outcomes**

The student is able to

- describe the importance of the visual user experience in applications
- Design and implement a simple modern web application
- apply image processing methods in the design of user interfaces
- Design and program a simple game

## **AT00BX91 Application of web and game technologies: 5 ECTS**

### **Learning outcomes**

The student is able to

- act as an expert in a small group and solve tasks together
- act as part of a project using agile project methods
- design web and game interfaces
- design and implement game environments

## **TLTITVT23KM-1012 IoT and embedded systems: 15 ECTS**

## **AT00BX92 IoT and embedded systems basics: 5 ECTS**

### **Learning outcomes**

The student is able to

- work in a small team and solve tasks together
- generalize basics of embedded design
- explain OS basics and structure
- explain microprocessor architectures and types
- explain basic data transfer methods
- evaluate simple schematics and electronics' documents
- categorize IoT and embedded systems

## **AT00BY05 IoT and embedded systems design: 5 ECTS**

### **Learning outcomes**

The student is able to

- document basic circuits in electronics
- design a simple IoT solution

- design a simple embedded system program with an appropriate programming language
- design a simple application using standard system calls
- analyze and categorize IoT and embedded system design

### **AT00BY06 Applications of IoT and embedded systems: 5 ECTS**

#### **Learning outcomes**

The student is able to

- design and implement basic electronic circuits
- implement a simple IoT solution
- implement a simple embedded system program with an appropriate programming language
- implement simple application using standard system calls
- expound an IoT and embedded system use in different applications

### **TLTITVT23KM-1013 Software engineering: 15 ECTS**

### **AT00BY07 Software engineering and architecture: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain different methods of software engineering
- use agile methods in software projects
- act as a software developer in multidisciplinary projects
- describe different software architectures and use them in development

### **AT00BY08 Data structures and algorithms: 3 ECTS**

#### **Learning outcomes**

The student is able to

- justify the use of different basic data structures and algorithms in programming
- use basic data structures and algorithms in software design and implementation

### **AT00BY09 Programming languages: 4 ECTS**

#### **Learning outcomes**

The student is able

- explains the object paradigm
- use different programming languages ??in the development of an object-based application
- use collection classes and their algorithms in different programming languages ??and apply them in different environments

### **AT00BY10 Software maintenance and testing: 3 ECTS**

#### **Learning outcomes**

The student is able to

- design and use basic software testing methods

- use software maintenance systems
- design the software to be maintained

## **TLTITVT23KM-1014 Tele communication: 15 ECTS**

### **AT00BY11 LAN basics and security: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain the impact of network topology and technology on the efficiency of data transfer
- utilize local area network services in their own work
- use the network analyzation tools and verify the networking protocols operation
- manage a workstation/server specific firewall, and understands the basics of packet filtering

### **AT00BY12 Network monitoring and redudancy: 5 ECTS**

#### **Learning outcomes**

The student is able to

- interconnect different parts of the data networks, and understands the differences between solutions and their impacts on performance as well as information security
- implement and connect a fault tolerant local area network into the Internet
- understand the most significant differences between different firewall technologies
- implement protection to the different network connected devices
- use network monitoring system to manage larger network entities

### **AT00BY13 Client-driven data networks: 5 ECTS**

#### **Learning outcomes**

The student is able to

- act as a member of the project team as a data network expert
- guide and lead other specialist when it comes to their own area of expertise
- make conclusions based on the success of the client project

## **TLTITVT23KM-1015 Media technology: 15 ECTS**

### **AT00BY14 Modelling: 5 ECTS**

#### **Learning outcomes**

The student knows how

- explain the basic structure of 3D models
- preferably 3D models for different uses
- Create and edit 3D models with different techniques
- create and edit 3D model materials
- use the basic features of the 3D modeling program
- create digital visualizations

---

## **AT00BY15 Game design basics: 5 ECTS**

### **Learning outcomes**

The student knows how

- explain the basic principles of game design
- make use of playfulness in different contexts
- describe the importance of game testing in game development
- design a game design work process

## **AT00BY16 Audiovisual technologies: 5 ECTS**

### **Learning outcomes**

The student knows how

- produce and edit videos
- produce and edit audio
- produces post-production of audiovisual output
- analyze and categorize media distribution

## **TLTITVT23KM-1016 Digital technology: 15 ECTS**

## **AT00BY17 Embedded computers: 5 ECTS**

### **Learning outcomes**

Student can

- Explain microprocessor circuits
- Choose microcontroller for different applications
- Put into use a microcontroller
- Make conclusions about embedded systems

## **AT00BY18 Electronics: 5 ECTS**

### **Learning outcomes**

Student can

- Define and name peripheral electronics
- Connect analogue and digital components
- Evaluate digital and analogue electronics from EMC and PCB design perspective
- Interpret peripheral electronics in different applications

## **AT00BY19 Digital technologies workshop: 5 ECTS**

### **Learning outcomes**

Student can

- Design embedded computer
- Implement embedded computer
- Analyze and interpret embedded computer design process and its outcome

---

## **TLTITVT23KM-1017 Web services: 15 ECTS**

### **AT00BY20 Javascript platforms: 4 ECTS**

#### **Learning outcomes**

The student is able to

- design an adaptive web interface
- implement a javascript based application on different implementation platforms
- expound the usability of the user interface

### **AT00BY21 Server technologies: 4 ECTS**

#### **Learning outcomes**

The student is able to

- compare browser and server technologies
- implement a database-based server application
- work as a leading software expert in multidisciplinary web development projects

### **AT00BY22 Frameworks: 3 ECTS**

#### **Learning outcomes**

Student is able to

- design and implement a modern web-application
- implement an asynchronous web-application
- use modern frameworks in implementing the web-application

### **AT00BY23 Cloud computing: 4 ECTS**

#### **Learning outcomes**

Student is able to

- design and use document databases
- design and implement API interfaces using a programming language
- design and implement a scalable microservice

## **TLTITVT23KM-1018 Mobile and game programming: 15 ECTS**

### **AT00BY24 Hybrid mobile programming: 5 ECTS**

#### **Learning outcomes**

The student is able to

- Act as a leading software expert in multidisciplinary game and mobile development projects
- Design and implement a hybrid mobile application
- design and implement responsive Mobile first and SPA applications

### **AT00BY25 Native mobile programming: 5 ECTS**

**Learning outcomes**

The student is able to

- design a native mobile application
- implement a native mobile application
- compare the differences between hybrid and native mobile applications

**AT00BY26 Advanced game programming: 5 ECTS****Learning outcomes**

The student knows how

- design and implement 2D and 3D games for different game platforms
- take advantage of the physics of game engines
- make use of mathematics and physics to implement game dynamics

**TLTITVT23KM-1019 Visual design: 15 ECTS****AT00BY27 User Interfaces and usability: 5 ECTS****Learning outcomes**

The student knows how

- explain the meaning of the user experience
- design visual content for the web environment
- create user-friendly interfaces

**AT00BY28 Web game environments: 5 ECTS****Learning outcomes**

The student knows how

- Design content for the web game environment
- Implement a we-play environment
- compare and interpret technologies in the web gaming environment

**AT00BY29 Graphics communication: 5 ECTS****Learning outcomes**

The student knows how

- explain the importance of graphic communication in communication
- design content through graphic communication
- implement content through graphical communication

**TLTITVT23KM-1020 Game technology: 15 ECTS****AT00BY30 Game modelling: 5 ECTS****Learning outcomes**

The student knows how

- utilizes modelling in different environments
- take advantage of the advanced features of game engines
- Use new technologies in gaming and augmented reality applications

### **AT00BY26 Advanced game programming: 5 ECTS**

#### **Learning outcomes**

The student knows how

- design and implement 2D and 3D games for different game platforms
- take advantage of the physics of game engines
- make use of mathematics and physics to implement game dynamics

### **AT00BY32 New technologies: 5 ECTS**

#### **Learning outcomes**

A student can:

- describe different kind of new technologies
- compare suitability of technologies against own needs
- utilize some of new technologies presented on the course

### **TLTITVT23KM-1021 Data centers and server systems: 15 ECTS**

### **AT00BY33 Virtualization and Cloud services: 5 ECTS**

#### **Learning outcomes**

The student is able to

- describe and recognize the benefits of virtualization and cloud computing when it comes to improving the efficiency of ICT services
- plan and execute a digital service using virtualization and cloud computing in a chosen platform
- discuss and justify the choice of virtualization environment or cloud computing service as a platform for digital services

### **AT00BY34 Servers and services: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain the possibilities of different server systems
- estimate the usability of different services
- design and implement various server systems with their services

### **AT00BY35 Implementation of the service: 5 ECTS**

#### **Learning outcomes**

The student is able to

- act as an data network expert in a project
- direct other data network technology experts in his / her area of expertise



- direct other information technology project members in data network related questions
- implement centralized online services in a customer-oriented and cost-conscious manner

### **TLTITVT23KM-1022 Embedded programming: 15 ECTS**

### **AT00BY36 Basics of embedded programming: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain the basics of operating systems in terms of software development
- implement an embedded system that utilizes a real-time operating system
- analyze the advantages and disadvantages of embedded programming

### **AT00BY37 Distributed Systems: 5 ECTS**

#### **Learning outcomes**

Student is able to

- explain principles of distribution and data communications concerning distributed embedded systems
- explain the methods, communication protocols and implementation frameworks used in distributed systems
- design and implement an distributed application

### **AT00BY38 Applications of IoT: 5 ECTS**

#### **Learning outcomes**

Student can

- Design and implement embedded IoT device using standard data transfer protocols
- Implement IoT hub as cloud service with simple data analysis and visualization application
- utilize unit testing tools to guarantee software quality
- work as a leading software specialist in IoT development project

### **TLTITVT23KM-1023 IoT systems and solutions: 15 ECTS**

### **AT00BY50 IoT development environments and systems: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain IoT development environments and systems
- develop IoT systems
- analyze IoT development environments and systems

### **AT00BY51 IoT communication systems and monitoring: 5 ECTS**

#### **Learning outcomes**

The student is able to

- explain IoT communication technologies
- describe IoT communication systems
- plan a secure IoT communication system
- have the knowledge and skills of Cisco CCNA (5 - 15 ects)

### **AT00BY52 IoT service client project: 5 ECTS**

#### **Learning outcomes**

Student can

- act a specialist in a customer project
- lead a team in a customer project
- take into account the profitability of the project

### **TLTITVT23KM-1024 Embedded devices: 15 ECTS**

### **AT00BY39 IoT devices: 5 ECTS**

#### **Learning outcomes**

Student can

- Describe different memory types
- Design and implement simple IoT device
- Design I/O interface
- Make memory circuits with different types of memories

### **AT00BY40 IoT and data transfer: 5 ECTS**

#### **Learning outcomes**

Student can

- Explain most common sensor types and busses
- Connect modules and memories
- Compare different data transfer methods and components

### **AT00BY41 IoT Workshop: 5 ECTS**

#### **Learning outcomes**

Student can

- Design IoT application
- Implement a practical implementation of an IoT pipeline
- Analyze the outcome

### **TLTITVT23KM-1025 Practical Training: 30 ECTS**

### **HA00BU59 Practical Training 1: 10 ECTS**

#### **Learning outcomes**

The student is able to

- describe work-related phenomena and use related concepts
- act in a productive way, following the practices of the workplace and the ethical principles of the profession
- use the techniques, work methods, models and processes that they have learnt
- act in a customer-oriented way in interactive situations in the workplace and in the cooperation network
- evaluate and develop their own competence in the work done in practical training

## **HA00BU60 Practical Training 2: 10 ECTS**

### **Learning outcomes**

The student is able to

- describe work-related phenomena and use related concepts
- act in a productive way, following the practices of the workplace and the ethical principles of the profession
- use the techniques, work methods, models and processes that they have learnt
- act in a customer-oriented way in interactive situations in the workplace and in the cooperation network
- evaluate and develop their own competence in the work done in practical training

## **HA00BU61 Practical Training 3: 10 ECTS**

### **Learning outcomes**

The student is able to

- describe work-related phenomena and use related concepts
- act in a productive way, following the practices of the workplace and the ethical principles of the profession
- use the techniques, work methods, models and processes that they have learnt
- act in a customer-oriented way in interactive situations in the workplace and in the cooperation network
- evaluate and develop their own competence in the work done in practical training

## **TLTITVT23KM-1026 Thesis: 15 ECTS**

## **AO00BU62 Thesis Planning: 5 ECTS**

### **Learning outcomes**

The student is able to:

- describe the objectives and core contents of their thesis
- plan and describe the stages of the thesis process
- take into account the possible research permit and copyright issues

## **AO00BU63 Thesis Project: 5 ECTS**

### **Learning outcomes**

The student is able to:

- implement the thesis on the basis of an approved thesis plan.

**AO00BU64 Thesis Report: 5 ECTS****Learning outcomes**

The student is able to:

- present the results or output of their thesis
- report on their thesis in writing in accordance with the thesis guidelines of LAB University of Applied Sciences
- write a maturity test.

**TLTITVT23KM-1027 COMPLEMENTARY COMPETENCE: 45 ECTS****TLTITVT23KM-1028 From data to machine learning: 15 ECTS****AT00BY42 Data analysis and visualization: 10 ECTS****Learning outcomes**

The student is able to

- utilize mathematical methods to analyze and to predict phenomena
- utilize a modern statistical tool
- visualize data to identify its properties, analysis interpretation and to facilitate further processing

**AT00BY43 Machine Learning: 5 ECTS****Learning outcomes**

The student is able to

- take advantage of both supervised and unsupervised machine learning in an appropriate way
- implement the fitting of the machine learning model
- take advantage of the supply of cloud services
- take into account the ethical guidelines of the authorities and the technology industry
- make use of existing machine learning ecosystems and equipment