

**Curriculum at LAB University of Applied Sciences  
2025-2026**

**Bachelor of Engineering, Electrical and Automation  
Engineering (in Finnish) 25S, full-time studies, Lahti**

Code	Name	1 y	2 y	3 y	4 y	ECTS total
<b>TLTISAT25S-1001 CORE COMPETENCE</b>						<b>185</b>
<b>TLTISAT25S-1025 Common Studies</b>						<b>5</b>
AY00BU56	Developing professional competence 1	1				1
AY00BU57	Developing professional competence 2		1			1
AY00BU58	Developing professional competence 3			1		1
A300CE13	Orientation to Sustainability Thinking	2				2
<b>TLTISAT25S-1022 Language and Communication Studies</b>						<b>15</b>
KS00DD59	Expert Communication Skills	5				5
KE00DD60	English for Engineering	5				5
KR00DD61	Swedish for Work, Written		2			2
KR00BU42	Swedish for Work, Spoken		1			1
KE00DD58	Intercultural Competence		2			2
<b>TLTISAT25S-1003 Professional Core Competence</b>						<b>120</b>
<b>TLTISAT25S-1026 Basic Studies in Mathematics and Physics</b>						<b>21</b>
AT00DC94	Basics of Algebra	3				3
AT00DE39	Basic studies in mathematics for electrical engineering	3				3
AT00DE40	Mathematics 1 for electrical engineering	3				3
AT00DE41	Mathematics 2 for electrical engineering		3			3
AT00DE34	Mathematics 3 for electrical engineering		3			3
AT00BT70	Basic studies in physics	3				3
AT00CU21	Physics for electrical engineering	3				3
<b>TLTISAT25S-1005 Basic Studies in Machinery</b>						<b>15</b>
AT00CV93	Technical documentation and modeling	5				5
AT00BV38	Pneumatics and Hydraulics	5				5
AT00CV78	Manufacturing Technologies 1	5				5
<b>TLTISAT25S-1027 Basics of Electrical Engineering</b>						<b>15</b>
AT00DE37	Basics of Electrical Engineering	3				3
AT00DE33	Basics of Electricity	4				4
AT00DE36	Electric Circuits	3				3
AT00CT56	Electrical Engineering Laboratory Work 1	5				5
<b>TLTISAT25S-1007 Electric Drives and Power Electronics</b>						<b>15</b>

AT00CT60	Electrical Machines		5			5
AT00CT61	Electric drives		5			5
AT00CT59	Electrical Engineering Laboratory Work 2		5			5
<b>TLTISAT25S-1008</b>	<b>Applications of Electrical Engineering and Automation</b>					<b>12</b>
AT00DA05	Basics of Programming	3				3
AT00DG90	Basics of JavaScript	3				3
AT00CV89	Electrical engineering applications		6			6
<b>TLTISAT25S-1009</b>	<b>Electrical Design</b>					<b>12</b>
AT00CT64	Electrical design in industrial installations		5			5
AT00DE38	Electrical design project work			5		5
AT00CW53	Preparation for the electrical safety examination (S1)				2	2
<b>TLTISAT25S-1010</b>	<b>Programmable Logics</b>					<b>15</b>
AT00BX17	Basics of Programmable Logic		5			5
AT00BX19	Operation Panels		5			5
AT00BX18	Applications of Programmable Logic		5			5
<b>TLTISAT25S-1011</b>	<b>PC Programming</b>					<b>15</b>
AT00BX20	PC-logics		5			5
AT00BX21	User interface and controls		5			5
AT00BX22	Automation Project			5		5
<b>TLTISAT25S-1012</b>	<b>Practical Training</b>					<b>30</b>
HA00CD55	Practical Training	5	5			10
HA00BU60	Practical Training 2		5	5		10
HA00BU61	Practical Training 3			5	5	10
<b>TLTISAT25S-1013</b>	<b>Thesis</b>					<b>15</b>
AO00BU62	Thesis Planning				5	5
AO00BU63	Thesis Project				5	5
AO00BU64	Thesis Report				5	5
<b>TLTISAT25S-1014</b>	<b>COMPLEMENTARY COMPETENCE</b>					<b>55</b>
<b>TLTISAT25S-1031</b>	<b>Intelligent Production Line</b>					<b>15</b>
AT00CG68	IoT principles in different sectors		5			5
AT00CG99	Industrial programming			5		5
AT00CH00	Project			5		5
<b>TLTISAT25S-1030</b>	<b>Industrial Robotics</b>					<b>15</b>
AT00CW54	Basics of industrial robotics			5		5
AT00CG93	Production Robotics				5	5
AT00CW55	Industrial robotics project				5	5
<b>TLTISAT25S-1032</b>	<b>Simulation</b>					<b>15</b>
AT00CG95	Production Simulation				5	5
AT00CG96	Automation of Production Cells			5		5

AT00CS53	Digital Twin principles in different sectors			5		5
<b>TLTISAT25S-1033 Software Engineering</b>						<b>15</b>
AT00BY07	Software engineering and architecture			5		5
AT00DG92	Basics of embedded programming			4		4
AT00DG93	Applications of IoT			3		3
AT00BY10	Software maintenance and testing			3		3
<b>TLTISAT25S-1019 Control Engineering in Power Electronics</b>						<b>15</b>
AT00CT58	Basics of power electronics			5		5
AT00CT67	Basics of control engineering		5			5
AT00CV92	Basics of digital control			5		5
<b>TLTISAT25S-1020 Electromobility Project</b>						<b>15</b>
AT00CV61	Electromobility project				15	15
<b>TLTISAT25S-1021 Elective Studies</b>						<b>10</b>

## TLTISAT25S-1001 CORE COMPETENCE: 185 ECTS

### TLTISAT25S-1025 Common Studies: 5 ECTS

### 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

### **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

### **TLTISAT25S-1022 Language and Communication Studies: 15 ECTS**

#### **KS00DD59 Expert Communication Skills: 5 ECTS**

##### **Learning outcomes**

The student is able to

- identify and assess their communication skills and give, receive and use feedback to develop their communication skills
- act purposefully, appropriately and skilfully in communication and interaction situations in work life and in his/her professional field (text, presentation and group communication skills)
- take into account the requirements of the recipient/interaction partner, the situation and the field in which they are communicating
- communicate in a structured, understandable and convincing way
- develop their Finnish language and communication skills as part of their expertise and professional competence (willingness and motivation to continuously learn and develop communication skills).

#### **KE00DD60 English for Engineering: 5 ECTS**

##### **Learning outcomes**

The student is able to

- perform effectively and professionally when applying for a job
- read and process basic texts from their field
- use and find vocabulary from their field
- communicate successfully and professionally about basic topics from their field
- communicate and work in an international environment

#### **KR00DD61 Swedish for Work, Written: 2 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.

### **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.

### **KE00DD58 Intercultural Competence: 2 ECTS**

#### **Learning outcomes**

The student is able to

- understand cultural similarities and differences using theoretical frameworks
- has skills and competences to develop their intercultural sensitivity
- understand culture adaptation and adjustment.

### **TLTISAT25S-1003 Professional Core Competence: 120 ECTS**

### **TLTISAT25S-1026 Basic Studies in Mathematics and Physics: 21 ECTS**

### **AT00DC94 Basics of Algebra: 3 ECTS**

#### **Learning outcomes**

The student is able to

- simplify and handle mathematical expressions
- solve basic equations and system of two linear equations
- basics of percentage calculation

### **AT00DE39 Basic studies in mathematics for electrical engineering: 3 ECTS**

#### **Learning outcomes**

Student is able to

- solve equations and simultaneous equations
- solve the angles and sides of different types of triangles and use similarity
- solve trigonometrical problems

**AT00DE40 Mathematics 1 for electrical engineering: 3 ECTS****Learning outcomes**

Student is able to

- recognize different polynomial equations and polynomial graphs
- solve inequalities
- solve basic derivation functions and utilize derivation in practice

**AT00DE41 Mathematics 2 for electrical engineering: 3 ECTS****Learning outcomes**

Student is able to

- solve integrated polynomial functions and utilize integration in practice
- solve geometric problems
- knows basics of vectors in plane and space
- basic concepts of matrices and solving matrices with software

**AT00DE34 Mathematics 3 for electrical engineering: 3 ECTS****Learning outcomes**

Student is able to

- solve derivation and integration of trigonometric and exponential functions
- basics of differential equations
- principles of complex number calculations
- basics of series theory

**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

**AT00CU21 Physics for electrical engineering: 3 ECTS****Learning outcomes**

The student is able to

- Perform physical measurements and write a proper report of the results
- Process measurement results, make graphical representations thereof, and perform error evaluation
- Perform calculations related to electric charge and magnetism
- Describe the electromagnetic behaviour of electric devices

**Prerequisites**

AT00CH50 Basic Studies in Physics or AT00BT70 Tekniikan fysiikan perusteet should be studied before, or some other course about basics in physics.

### **TLTISAT25S-1005 Basic Studies in Machinery: 15 ECTS**

### **AT00CV93 Technical documentation and modeling: 5 ECTS**

#### **Learning outcomes**

The student is able to

- interpret technical drawings
- create simple technical drawings using computer aided design

### **AT00BV38 Pneumatics and Hydraulics: 5 ECTS**

#### **Learning outcomes**

Student is able to

- use basic components in pneumatics and hydraulics
- design pneumatic application
- design hydraulic application

### **AT00CV78 Manufacturing Technologies 1: 5 ECTS**

#### **Learning outcomes**

The student is able to

- work safely in a metal workshop / laboratory
- identify and name the basic components and standard parts of mechanical engineering
- uses tools and measuring instruments
- includes basic terminology related to mechanical engineering.

### **TLTISAT25S-1027 Basics of Electrical Engineering: 15 ECTS**

### **AT00DE37 Basics of Electrical Engineering: 3 ECTS**

#### **Learning outcomes**

The student is able to

- recognize the fundamental electrical quantities and their interrelations
- solve simple DC and AC circuits
- explain the principle of a three-phase system and three-phase power
- describe the most common applications of electrical engineering

### **AT00DE33 Basics of Electricity: 4 ECTS**

#### **Learning outcomes**

The student is able to

- describe electrical phenomena behind technological development
- mathematically solve problems related to electricity and the decibel scale

- perform calculations related to electric charge and magnetism
- apply digitalisation in the processing of results

### **AT00DE36 Electric Circuits: 3 ECTS**

#### **Learning outcomes**

Student is able to

- solve simple AC and DC circuits
- utilise phasors
- describe the properties and some of the uses of most common semiconductor components
- use simulation software

### **AT00CT56 Electrical Engineering Laboratory Work 1: 5 ECTS**

#### **Learning outcomes**

Student is able to

- use basic electrical measuring equipment
- plan and report laboratory work

### **TLTISAT25S-1007 Electric Drives and Power Electronics: 15 ECTS**

### **AT00CT60 Electrical Machines: 5 ECTS**

#### **Learning outcomes**

The student is able to

- describe the working principle, properties, and typical applications of the most common electric machine types
- form a single-phase equivalent circuit of an electric machine
- state the most important selection and dimensioning principles of electric machines in industrial applications

### **AT00CT61 Electric drives: 5 ECTS**

#### **Learning outcomes**

The student is able to

- design and dimension the contactor controls of a direct-on-line electric drive
- design the safety circuit of an electric drive
- dimension the protective devices and cabling of an electric drive
- dimension and parameterise a frequency converter controlled electric motor drive
- describe the possibilities of connecting a frequency converter to the automation system

### **AT00CT59 Electrical Engineering Laboratory Work 2: 5 ECTS**

#### **Learning outcomes**

The student is able to

- work safely in the laboratory at low voltage (< 1000 VAC)



- plan and implement electric setups in the laboratory
- perform electrical measurements, analyze and report results thereof, and write a report

## **TLTISAT25S-1008 Applications of Electrical Engineering and Automation: 12 ECTS**

### **AT00DA05 Basics of Programming: 3 ECTS**

#### **Learning outcomes**

The student is able to:

- perform tasks on a computer through programming
- utilize and process data programmatically
- understand common programming structures
- understand the syntax of a programming language.
- implement small programs in the Python programming language

### **AT00DG90 Basics of JavaScript: 3 ECTS**

#### **Learning outcomes**

The student is able to

- utilize JavaScript language to create dynamic web content
- utilize open source JavaScript libraries
- create functional user interfaces that utilize the JavaScript language, for example, in input validation

### **AT00CV89 Electrical engineering applications: 6 ECTS**

#### **Learning outcomes**

The student is able to

- describe the structure of electrical transmission and distribution networks and their essential design principles
- describe the essential design principles related to high voltage systems and their protective equipment
- utilize the decrees and guidelines related to electric installations in buildings

### **TLTISAT25S-1009 Electrical Design: 12 ECTS**

### **AT00CT64 Electrical design in industrial installations: 5 ECTS**

#### **Learning outcomes**

The student is able to

- utilise CAD software as a tool in electric design
- read and create technical documentation related to electric design
- design an electric cabinet, select and dimension its components
- dimension and select cables
- design overload and short circuit protection

## **AT00DE38 Electrical design project work: 5 ECTS**

### **Learning outcomes**

Student:

- Be able to work in a project work environment and in a project.
- Can understand the different phases of a project and the principles of planning, management and control.
- Can report on the progress of a project at different stages.
- Can receive and give suggestions for improvement and feedback in project management tasks.
- Can evaluate the success of a project.

## **AT00CW53 Preparation for the electrical safety examination (S1): 2 ECTS**

### **Learning outcomes**

The student is able to:

- master the subject matter of the national electrical safety examination (S1)

## **TLTISAT25S-1010 Programmable Logics: 15 ECTS**

## **AT00BX17 Basics of Programmable Logic: 5 ECTS**

### **Learning outcomes**

Student is able to

- recognize basic constructure of the logic program
- use TIA-portal
- use basic commands
- use data in programming
- carry out logic sequences using LD

## **AT00BX19 Operation Panels: 5 ECTS**

### **Learning outcomes**

Student is able to

- connect operation panel with programmable logic in TIA-portal
- design basic interface
- design optimal operation panel software
- use operation panel in production line control
- design compact data collection system in programmable logic

## **AT00BX18 Applications of Programmable Logic: 5 ECTS**

### **Learning outcomes**

Student is able to

- describe principal structures of sensors and inverter in programmable logics
- design linearic drive
- design product control system in programmable logics

- design material handling logic control with TIA-portal

## **TLTISAT25S-1011 PC Programming: 15 ECTS**

### **AT00BX20 PC-logics: 5 ECTS**

#### **Learning outcomes**

Student is able to

- describe differences between PC and PLC controls
- use PC-control fieldbus
- use PC-control software
- program PC-controls

### **AT00BX21 User interface and controls: 5 ECTS**

#### **Learning outcomes**

Student is able to

- recognize the basics of user interface
- program alarms
- transfer user interface for PC control
- animate production lines
- create a control system for simple production line

### **AT00BX22 Automation Project: 5 ECTS**

#### **Learning outcomes**

Student is able to

- carry out automation system for production line
- carry out fieldbus and PC-control
- carry out control panel

## **TLTISAT25S-1012 Practical Training: 30 ECTS**

### **HA00CD55 Practical Training: 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 into 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 into 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 into the work done in practical training

**TLTISAT25S-1013 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.

**TLTISAT25S-1014 COMPLEMENTARY COMPETENCE: 55 ECTS****TLTISAT25S-1031 Intelligent Production Line: 15 ECTS****AT00CG68 IoT principles in different sectors: 5 ECTS****Learning outcomes**

Student is able to

- describe a structure of the IoT-system
- knowledge basics of sensors and data collection in IoT systems
- compare IoT cloud environments
- describe requirements for IoT mobile software
- use IoT in business

**AT00CG99 Industrial programming: 5 ECTS****Learning outcomes**

Student is able to

- plan and program control systems
- program softwares
- describe database usage and report principals
- define database sources
- plan a reporting system

**AT00CH00 Project: 5 ECTS****Learning outcomes**

Student is able to

- create a project plan
- implement a advanced automation software
- report results

**TLTISAT25S-1030 Industrial Robotics: 15 ECTS****AT00CW54 Basics of industrial robotics: 5 ECTS****Learning outcomes**

Student is able to

- use robotics in different applications

**AT00CG93 Production Robotics: 5 ECTS****Learning outcomes**

Student is able to

- design and build robot cell

- 
- recognize a robot as a part of the production line

### **AT00CW55 Industrial robotics project: 5 ECTS**

#### **Learning outcomes**

The student is able to

- program robot application

### **TLTISAT25S-1032 Simulation: 15 ECTS**

### **AT00CG95 Production Simulation: 5 ECTS**

#### **Learning outcomes**

Student is able to

- simulate a machine
- simulate a production line

### **AT00CG96 Automation of Production Cells: 5 ECTS**

#### **Learning outcomes**

The student is able to

- simulate the operation of a manufacturing cell
- select automation components for a manufacturing cell
- apply bus technology in the data transfer of automation systems

### **AT00CS53 Digital Twin principles in different sectors: 5 ECTS**

#### **Learning outcomes**

Student is able to

- describe a structure of the Digital Twin-system
- create overall view of Digital Twin technology possibilities
- compare simulation and Digital Twin technologies
- describe requirements for Digital Twin application
- use Digital Twin in business

### **TLTISAT25S-1033 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

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## **AT00DG92 Basics of embedded programming: 4 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

## **AT00DG93 Applications of IoT: 3 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

## **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

## **TLTISAT25S-1019 Control Engineering in Power Electronics: 15 ECTS**

## **AT00CT58 Basics of power electronics: 5 ECTS**

### **Learning outcomes**

The student is able to

- Describe the properties of basic power electronic components and some of their uses
- Describe the most common DC/DC converter topologies and explain their principles of operation
- Describe the structure of a voltage source inverter, its principle of operation and most important applications

## **AT00CT67 Basics of control engineering: 5 ECTS**

### **Learning outcomes**

The student is able to

- Model simple continuous-time dynamic systems
- Design a PID controller and simulate its behaviour

## **AT00CV92 Basics of digital control: 5 ECTS**

**Learning outcomes**

The student is able to:

- describe and analyze the characteristics of a discrete-time system
- discretize a continuous-time system
- design a discrete-time controller
- implement a discrete-time controlled in software

**TLTISAT25S-1020 Electromobility Project: 15 ECTS****AT00CV61 Electromobility project: 15 ECTS****Learning outcomes**

The student is able to:

- work as a member in a project team and interact with stakeholders
- define the requirements of a device or a system and design it according to the requirements
- implement selected aspects of a device or a system
- validate the fulfillment of the requirements using appropriate methods

**TLTISAT25S-1021 Elective Studies: 10 ECTS**