20.09.2024

Curriculum at LAB University of Applied Sciences 2025-2026

Bachelor of Engineering, Electrical and Automation Engineering 25K, part-time studies, Lahti

Code	Name	1 y	2 y	3 y	4 y	ECTS total
TLTISAT25KM-1001	**CORE COMPETENCE**					**180**
TLTISAT25KM-1002	**Common Studies**					**15**
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
KE00BT61	English for Work	4				4
KR00BU42	Swedish for Work, Spoken		1			1
KR00BU43	Swedish for Work, Written		1			1
KS00BT59	Expert Communication Skills	4				4
TLTISAT25KM-1003	**Professional Core Competence**					**120**
TLTISAT25KM-1004	**Basic Studies in Mathematics and Physics**					**21**
AT00DE39	Basic studies in mathematics for electrical engineering	3				3
AT00DC94	Basics of Algebra	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
TLTISAT25KM-1005	**Basic Studies in Machinery**					**15**
AT00CV93	Technical documentation and modeling	5				5
AT00BV38	Pneumatics and Hydraulics	5				5
AT00BV33	Basics of Manufacturing Methods	5				5
TLTISAT25KM-1006	**Basics of Electrical Engineering**					**15**
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
TLTISAT25KM-1007	**Electric drives and power electronics**					**15**
AT00CT60	Electrical Machines		5			5

AT00CT61	Electric drives		5			5
AT00CT59	Electrical Engineering Laboratory Work 2		5			5
TLTISAT25KM-1008	**Applications of electrical engineering and automation**					**12**
AT00DA05	Basics of Programming	3				3
AT00BT79	Web and interactivity	3				3
AT00CV89	Electrical engineering applications	6				6
TLTISAT25KM-1009	**Electrical design**					**12**
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
TLTISAT25KM-1010	**Programmable logics**					**15**
AT00BX17	Basics of Programmable Logic		5			5
AT00BX19	Operation Panels		5			5
AT00BX18	Applications of Programmable Logic		5			5
TLTISAT25KM-1011	**PC programming**					**15**
AT00BX20	PC-logics		5			5
AT00BX21	User interface and controls		5			5
AT00BX22	Automation Project			5		5
TLTISAT25KM-1012	**Practical Training**					**30**
HA00CD55	Practical Training	10				10
HA00BU60	Practical Training 2		10			10
HA00BU61	Practical Training 3			10		10
TLTISAT25KM-1013	**Thesis**					**15**
AO00BU62	Thesis Planning				5	5
AO00BU63	Thesis Project				5	5
AO00BU64	Thesis Report				5	5
TLTISAT25KM-1014	**COMPLEMENTARY COMPETENCE**					**60**
TLTISAT25KM-1015	**Intelligent production line**					**15**
AT00CH00	Project		5			5
AT00CS53	Digital Twin principles in different sectors			5		5
AT00CG68	IoT principles in different sectors			5		5
TLTISAT25KM-1016	**Software engineering**					**15**
AT00CX26	Embedded control systems			7		7
AT00BY10	Software maintenance and testing			3		3
AT00CT67	Basics of control engineering			5		5
TLTISAT25KM-1017	**Electrical engineering and automation project**					**15**
AT00CT77	Electrical engineering and automation project			7,5	7,5	15
TLTISAT25KM-1018	**Elective Studies**					**15**

TLTISAT25KM-1001 CORE COMPETENCE: 180 ECTS

TLTISAT25KM-1002 Common Studies: 15 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 competenciesduring 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

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.

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.

TLTISAT25KM-1003 Professional Core Competence: 120 ECTS

TLTISAT25KM-1004 Basic Studies in Mathematics and Physics: 21 ECTS

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

AT00DC94 Basics of Algebra: 3 ECTS

Learning outcomes
Student is able to
- simplify and handle mathematical expressions
- solve basic equations and system of two linear equations
- basics of percentage calculation

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

TLTISAT25KM-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

AT00BV33 Basics of Manufacturing Methods: 5 ECTS

Learning outcomes
Student is able to
- apply different manufacturing methods for different materials
- recognise common manufacturing methods

TLTISAT25KM-1006 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

TLTISAT25KM-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

TLTISAT25KM-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

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

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

TLTISAT25KM-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)

TLTISAT25KM-1010 Programmable logics: 15 ECTS

AT00BX17 Basics of Programmable Logic: 5 ECTS

Learning outcomes
Student is able to
- regognize 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
- descripe 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

TLTISAT25KM-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
- regognize 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

TLTISAT25KM-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 int 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 int 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 int the work done in practical training

TLTISAT25KM-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.

TLTISAT25KM-1014 COMPLEMENTARY COMPETENCE: 60 ECTS

TLTISAT25KM-1015 Intelligent production line: 15 ECTS

AT00CH00 Project: 5 ECTS

Learning outcomes
Student is able to
- create a project plan
- implement a advanced automation software
- report results

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

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

TLTISAT25KM-1016 Software engineering: 15 ECTS

AT00CX26 Embedded control systems: 7 ECTS

Learning outcomes
The student is able to
- Recognize the main components of an embedded system and understand the system architecture
- Design and implement embedded software in the C programming language for hard real-time applications
- Design and implement a simple embedded device

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

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

TLTISAT25KM-1017 : 15 ECTS

AT00CT77 Electrical engineering and automation project: 15 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.

TLTISAT25KM-1018 Elective Studies: 15 ECTS