

Curriculum at LAB University of Applied Sciences 2023-2024

Bachelor of Engineering, Electrical and Automation Engineering 23K, part-time studies, Lappeenranta

Code	Name	1 y	2 y	3 y	4 y	ECTS total
TLPRSAT23KM-1001 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
TLPRSAT23KM-1002 Professional Core Competence						147
TLPRSAT23KM-1003 Common Core Competence						137
TLPRSAT23KM-1004 Basic studies in mathematics and physics						15
AT00CW18	Basic studies in mathematics for electrical engineering	3				3
AT00CW19	Mathematics 1 for electrical engineering	3				3
AT00CW20	Mathematics 2 for electrical engineering		3			3
AT00BT70	Basic studies in physics	3				3
AT00CU21	Physics for electrical engineering	3				3
TLPRSAT23KM-1009 Basics of Electrical Engineering						15
AT00CU99	Basics of Electrical Engineering	5				5
AT00CT55	Electric Circuits	5				5
AT00CT56	Electrical Engineering Laboratory Work 1	5				5
TLPRSAT23KM-1011 Applications of electrical engineering						16
AT00CV89	Applications of electrical engineering		6			6
AT00CT58	Basics of power electronics			5		5
AT00CT59	Electrical Engineering Laboratory Work 2		5			5
TLPRSAT23KM-1012 Electric Drives						15
AT00CT60	Electrical Machines		5			5
AT00CT61	Electric Drives		5			5
AT00CT62	Electric Drive Project			5		5
TLPRSAT23KM-1013 Electrical design						15

AT00CT63	Working and Electrical Safety	2				2
AT00CU25	Electrical Safety Certificate of Qualification (S1)				2	2
AT00CT64	Electrical design in industrial installations		5			5
AT00CT65	Electrical design project work		6			6
TLPRSAT23KM-1014 Automaation perusteet						15
AT00BX17	Basics of Programmable Logic	5				5
AT00CT66	Measurement Technology		5			5
AT00BX19	Operation Panels		5			5
TLPRSAT23KM-1015 Automation of Process Technology						15
AT00CT67	Basics of control engineering		5			5
AT00CT68	Process automaation systems			5		5
AT00CT69	Process automaation project			5		5
TLPRSAT23KM-1016 Project work of electrical engineering and automation						15
AT00CT77	Electrical engineering and automation project				15	15
TLPRSAT23KM-1017 Basics of Information and Telecommunication Technologies						16
CT00CL97	Fundamentals of Programming	6				6
AT00BT77	Telecommunications and security basics	5				5
AT00CG68	IoT principles in different sectors		5			5
TLPRSAT23KM-1005 Complementary Common Core Competence						10
AT00BV40	Robotics					0
AT00BT78	Objects and databases					0
AT00BY44	Research Seminar					0
AT00BX18	Applications of Programmable Logic					0
AT00BX20	PC-logics					0
AT00BX21	User interface and controls					0
AT00BX22	Automation Project					0
TLPRSAT23KM-1006 Complementary Competence						33
AL00BV22	Accounting					0
AL00CJ10	Lean and processes					0
AL00CJ07	Inhouse logistics					0
AL00CD63	Management and Leadership					0
AT00BV33	Basics of Manufacturing Methods					0
AT00CB83	Project Learning in Enterprises					0
TLPRSAT23KM-1007 Practical Training						30
HA00BU59	Practical Training 1		10			10
HA00BU60	Practical Training 2			10		10
HA00BU61	Practical Training 3				10	10
TLPRSAT23KM-1008 Thesis						15
AO00BU62	Thesis Planning				5	5
AO00BU63	Thesis Project				5	5
AO00BU64	Thesis Report				5	5

TLPRSAT23KM-1001 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.

TLPRSAT23KM-1002 Professional Core Competence: 147 ECTS

TLPRSAT23KM-1003 Common Core Competence: 137 ECTS

TLPRSAT23KM-1004 Basic studies in mathematics and physics: 15 ECTS

AT00CW18 Basic studies in mathematics for electrical engineering: 3

ECTS

Learning outcomes

Student is able to

- calculate and simulate mathematical expressions
- solve pair and group of equations
- solve trigonometrical problems

AT00CW19 Mathematics 1 for electrical engineering: 3 ECTS

Learning outcomes

Student is able to

- recognise different polynomial equations and polynomial graph
- solve inequalities
- solve basic derivation functions and utilise derivation in practice
- solve integrated polynomial functions and utilise integration in practice
- derive and integrate trigonometric functions

AT00CW20 Mathematics 2 for electrical engineering: 3 ECTS

Learning outcomes

Student is able to

- basics of differential equations
- solve geometric problems
- solve and utilize basic plane and space vectors
- basic concepts of matrices and solving matrices with software

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

TLPRSAT23KM-1009 Basics of Electrical Engineering: 15 ECTS

AT00CU99 Basics of Electrical Engineering: 5 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

AT00CT55 Electric Circuits: 5 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

TLPRSAT23KM-1011 Applications of electrical engineering: 16 ECTS**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

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

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

TLPRSAT23KM-1012 Electric Drives: 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

AT00CT62 Electric Drive Project: 5 ECTS

TLPRSAT23KM-1013 Electrical design: 15 ECTS

AT00CT63 Working and Electrical Safety: 2 ECTS

Learning outcomes

The student is able to

- recognize the dangers of electricity
- know the roles and responsibilities in electrical work
- pass the SFS6002 examination

AT00CU25 Electrical Safety Certificate of Qualification (S1): 2 ECTS

Learning outcomes

Student is able to

- carry out Electrical Safety Certificate of Qualification

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

AT00CT65 Electrical design project work: 6 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.

TLPRSAT23KM-1014 : 15 ECTS

AT00BX17 Basics of Programmable Logic: 5 ECTS

Learning outcomes

Student is able to

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

AT00CT66 Measurement Technology: 5 ECTS

Learning outcomes

Student is able to

- choose a sensor for measuring different quantities
- interface the sensor
- describe the effects of the properties of the sensor for the system

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

TLPRSAT23KM-1015 Automation of Process Technology: 15 ECTS

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

AT00CT68 Process automation systems: 5 ECTS

AT00CT69 Process automation project: 5 ECTS

TLPRSAT23KM-1016 Project work of electrical engineering and automation: 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.

TLPRSAT23KM-1017 Basics of Information and Telecommunication Technologies: 16 ECTS

CT00CL97 Fundamentals of Programming: 6 ECTS

Learning outcomes

On completion of this course student can: 1. Create small Python programs using basic commands and structures like lists and classes. 2. Utilize functions and libraries to create a program structure that is easy to understand, maintain, and expand. 3. Create Python programs that can read CSV files, select data of interest from there, and do basic analysis to the data. 4. Do basic testing and quality assurance of a small Python program.

Evaluation criterias

Level 1

0 - 5. Exam 50 %, project 25%, weekly assignments 25%. The responsible teacher can give the final grade based on the overall evaluation of all the course deliverables.

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

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

TLPRSAT23KM-1005 Complementary Common Core Competence: 10 ECTS

AT00BV40 Robotics: 5 ECTS

Learning outcomes

Student is able to

- recognize different types of robots
- program robots in basic level
- build up simple robotic cell

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

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

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

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

TLPRSAT23KM-1006 Complementary Competence: 33 ECTS

AL00BV22 Accounting: 5 ECTS

Learning outcomes

The student is able to

- take care of the accounting of a small company and draw up the financial statements

- understand the principles of VAT
- recognise how product costs are formed and apply this knowledge in the analysis of company profitability

AL00CJ10 Lean and processes: 5 ECTS

Learning outcomes

Student is able to

- demonstrate the principles of Lean thinking
- describe principles of process thinking
- recognize the importance of Lean thinking in relation to process operations
- describe the principles of optimization and connect them to business and environmental thinking
- recognize the obstacles of smooth processes flow and possible waste and its importance to labor productivity
- utilize Lean methodologies and problem-solving tools as part of process improvement

AL00CJ07 Inhouse logistics: 5 ECTS

Learning outcomes

Student is able to

- use inhouse logistics professional terminology
- recognize affects of inhouse logistics in company's competitiveness and profitability
- recognize inhouse logistics operating principles and processes
- name and compare different inhouse logistics contributing factors and trends

AL00CD63 Management and Leadership: 5 ECTS

Learning outcomes

Students knows:

- key management & leadership models and methods.
- the characteristics of modern management & leadership and the importance of the organization of the work community.
- the diverse field of responsibilities of managers and their own role in it.
- basics of labor law

AT00BV33 Basics of Manufacturing Methods: 5 ECTS

Learning outcomes

Student is able to

- apply different manufacturing methods for different materials
- recognise common manufacturing methods

AT00CB83 Project Learning in Enterprises: 15 ECTS

Learning outcomes

Student is able to

- use professional competencies in expert and supervising duties
- document and report personal professional development

TLPRSAT23KM-1007 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

TLPRSAT23KM-1008 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.