

**Curriculum at LAB University of Applied Sciences  
2021-2022**

**Bachelor of Engineering, Mechanical Engineering 21S, full-time studies, Lahti**

Code	Name	1 y	2 y	3 y	4 y	ECTS total
<b>KONE21SLTI-1001 Common Studies</b>						<b>15</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
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
<b>KONE21SLTI-1002 Professional Core Competence</b>						<b>120</b>
<b>KONE21SLTI-1003 Common Core Competence</b>						<b>120</b>
<b>KONE21SLTI-1004 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
AT00BU66	Advanced studies in physics of mechanical engineering	3				3
<b>KONE21SLTI-1005 Basic studies in mechanical engineering</b>						<b>15</b>
AT00BV33	Basics of Manufacturing Methods	5				5
AT00BZ36	Basics of mechanical engineering	5				5
AT00BV34	Digital Tools	5				5
<b>KONE21SLTI-1006 Basic studies in machinery</b>						<b>15</b>
AT00BV35	Basics of Machine Drawing	5				5
AT00BV37	Material's Structure and Properties	5				5
AT00BV38	Pneumatics and Hydraulics	5				5
<b>KONE21SLTI-1007 Production technology</b>						<b>15</b>
AT00BV43	Production Technology		3			3
AT00BV44	Welding and Metal Sheet Technology		3			3
AT00BV45	Machining		3			3
AT00BX11	Production Technology Project		3			3
AT00BX12	Basics of Machine Elements		3			3

**KONE21SLTI-1008 Mechanical engineering 15**

AT00BW72	Mechanics		5			5
AT00BW73	Statistics		5			5
AT00BX13	Strength of Materials		5			5

**KONE21SLTI-1009 Basics in automation 15**

AT00CN60	Basics of Electrical Engineering	5				5
AT00CN61	Basics in automation	5				5
AT00CT11	Robotics		5			5

**KONE21SLTI-1010 Mechanical design 15**

AT00BX14	Machine Drawing in Practice	5				5
AT00BX15	Mechanical Device and Product Design		5			5
AT00CR29	Machine Design Project		5			5

**KONE21SLTI-1012 Programmable logics 15**

AT00BX17	Basics of Programmable Logic		5			5
AT00BX18	Applications of Programmable Logic		5			5
AT00BX19	Operation Panels		5			5

**KONE21SLTI-1016 Complementary Competence 60****KONE21SLTI-1011 Business and production economy 15**

AT00BZ37	Business and Marketing			5		5
AT00BZ38	Management and Quality			5		5
AT00BZ39	Operations Control			5		5

**KONE21SLTI-1017 Advanced studies in mechanical engineering 15**

AT00BX23	Strength of Materials in practice			5		5
AT00BX24	Machine Dynamics			5		5
AT00BX25	Machine parts			5		5

**KONE21SLTI-1018 Advanced studies in machinery 15**

AT00BX26	Mechanical Engineering Large Scale Project				5	5
AT00BX27	Steel Structures				5	5
AT00BX28	Mechanical Vibrations				5	5

**KONE21SLTI-1019 Mechanical engineering applications 15**

AT00BX29	Finite Element Method				5	5
AT00BX30	Product Development and Innovations				5	5
AT00BX31	Virtual Design Project				5	5

**KONE21SLTI-1014 PC programming 15**

AT00BX20	PC-logics			5		5
AT00BX21	User interface and controls			5		5
AT00BX22	Automation Project			5		5

**KONE21SLTI-1024 Robotics 15**

AT00CG92	Advanced Robotics			5		5
AT00CG93	Production Robotics			5		5

AT00CG94	Robotics Project				5	5
<b>KONE21SLTI-1025 Production 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>KONE21SLTI-1026 Smart production</b>						<b>15</b>
AT00CG68	IoT principles in different sectors		5			5
AT00CG99	Industrial programming			5		5
AT00CH00	Project			5		5
<b>KONE21SLTI-1027 Individual learning path</b>						<b>15</b>
AT00CB83	Project Learning in Enterprises					0
<b>KONE21SLTI-1021 Practical Training</b>						<b>30</b>
HA00CD55	Practical Training		10			10
HA00BU60	Practical Training 2			10		10
HA00BU61	Practical Training 3				10	10
<b>KONE21SLTI-1022 Thesis</b>						<b>15</b>
AO00BU62	Thesis Planning				5	5
AO00BU63	Thesis Project				5	5
AO00BU64	Thesis Report				5	5

## **KONE21SLTI-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 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

## **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.

**KONE21SLTI-1002 Professional Core Competence: 120 ECTS****KONE21SLTI-1003 Common Core Competence: 120 ECTS****KONE21SLTI-1004 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

### **AT00BU66 Advanced studies in physics of mechanical engineering: 3 ECTS**

#### **Learning outcomes**

The student is able to

- solve mathematical tasks in heat transfer
- solve mathematical tasks in wave motion
- carry out and report physical measurements

### **KONE21SLTI-1005 Basic studies in mechanical engineering: 15 ECTS**

### **AT00BV33 Basics of Manufacturing Methods: 5 ECTS**

#### **Learning outcomes**

Student is able to

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

### **AT00BZ36 Basics of mechanical engineering: 5 ECTS**

#### **Learning outcomes**

Student is able to

- work safely in engineering environment
- recognize basic components and standard parts
- use basic tools

### **AT00BV34 Digital Tools: 5 ECTS**

#### **Learning outcomes**

Student is able to

- work in a virtual learning environment
- make reports and analyses with the help of wordprocessing and spreadsheet calculation software
- use correct cloud environment individually and in a group

- 
- carry out digital project presentation

## **KONE21SLTI-1006 Basic studies in machinery: 15 ECTS**

### **AT00BV35 Basics of Machine Drawing: 5 ECTS**

#### **Learning outcomes**

Student is able to

- carry out standard drawings
- apply tolerances
- use correct drawing symbols
- apply matching software

### **AT00BV37 Material's Structure and Properties: 5 ECTS**

#### **Learning outcomes**

The student knows

- the structure of the material and its effect on the properties
- different methods of modifying properties
- various models for predicting behavior of materials

### **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

## **KONE21SLTI-1007 Production technology: 15 ECTS**

### **AT00BV43 Production Technology: 3 ECTS**

#### **Learning outcomes**

Student is able to

- recognize the basics of different production types
- design simple production line mechanically

### **AT00BV44 Welding and Metal Sheet Technology: 3 ECTS**

#### **Learning outcomes**

Student is able to

- recognize basics in welding and sheet metal work
- control welding and sheet metal manufacturing quality
- use welding and sheet metal work in practice

**AT00BV45 Machining: 3 ECTS****Learning outcomes**

Student is able to

- recognize basics in machining
- use NC programming in machining

**AT00BX11 Production Technology Project: 3 ECTS****Learning outcomes**

Student is able to

- use machining, welding and sheet plate engineering in practice

**AT00BX12 Basics of Machine Elements: 3 ECTS****Learning outcomes**

Student is able to

- recognize most common machine parts
- design machine part joints

**KONE21SLTI-1008 Mechanical engineering: 15 ECTS****AT00BW72 Mechanics: 5 ECTS****Learning outcomes**

Student is able to

- recognize principles of basic mechanics
- calculate simple tasks of mechanical structures

**AT00BW73 Statistics: 5 ECTS****Learning outcomes**

Student is able to

- define static structure
- calculate structure measurements
- calculate different forces

**AT00BX13 Strength of Materials: 5 ECTS****Learning outcomes**

Student is able to

- calculate shear stresses
- calculate torsion and bending stresses
- calculate stresses under deformation

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**KONE21SLTI-1009 Basics in automation: 15 ECTS****AT00CN60 Basics of Electrical Engineering: 5 ECTS****Learning outcomes**

Student is able to

- basics of direct current
- basics of alternating current
- basics of combination logic

**AT00CN61 Basics of Automation: 5 ECTS****Learning outcomes**

Student is able to

- describe basic automation process
- design simple electrical device
- choose sensors
- design basic electrical motor

**AT00CT11 Robotics: 5 ECTS****Learning outcomes**

Student is able to

- understand the impact of robotics for society
- recognize the basics of service robotics
- describe basic operations of robotic process automation
- describe basics of industrial robotics
- understand possibilities of collaboration robotics
- describe basic utilizations of AI in robotics

**KONE21SLTI-1010 Mechanical design: 15 ECTS****AT00BX14 Machine Drawing in Practice: 5 ECTS****Learning outcomes**

Student is able to

- recognize geometric tolerances in designing
- use required marking and notes in documents
- produce finished documents for production with selected software

**AT00BX15 Mechanical Device and Product Design: 5 ECTS****Learning outcomes**

Student is able to

- carry design project
- calculate cost effects in design

- 
- relate different design areas with a selected software
  - use PDM system

### **AT00CR29 Machine Design Project: 5 ECTS**

#### **Learning outcomes**

Student is able to

- plan and deliver machine design project
- deliver machine design project based on initial data
- work as a member in a project team

### **KONE21SLTI-1012 Programmable logics: 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

### **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

### **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

### **KONE21SLTI-1016 Complementary Competence: 60 ECTS**

### **KONE21SLTI-1011 Business and production economy: 15 ECTS**

**AT00BZ37 Business and Marketing: 5 ECTS****Learning outcomes**

Student is able to

- recognize a meaning of cash flow in business
- define customer based products and services
- recognize the influence of different development work in cash flow

**AT00BZ38 Management and Quality: 5 ECTS****Learning outcomes**

The student

- understands the agreements and regulations related to the running of a business
- evaluate various management methods and their significance
- understands the importance of quality

**AT00BZ39 Operations Control: 5 ECTS****Learning outcomes**

Student is able to

- define most important development issues in business
- evaluate and develop internal logistics
- evaluate and develop issues in delivery chain

**KONE21SLTI-1017 Advanced studies in mechanical engineering: 15 ECTS****AT00BX23 Strength of Materials in practice: 5 ECTS****Learning outcomes**

Student is able to

- recognize fatigue strength in dimensioning
- recognize buckling in calculations
- calculate hyperstatic structures

**AT00BX24 Machine Dynamics: 5 ECTS****Learning outcomes**

Student is able to

- calculate horizontal forces
- calculate rotate forces
- calculate angular momentum

**AT00BX25 Machine parts: 5 ECTS****Learning outcomes**

Student is able to

- use machine parts widely in design
- calculate measurements of pressure vessels and pipelines

### **KONE21SLTI-1018 Advanced studies in machinery: 15 ECTS**

### **AT00BX26 Mechanical Engineering Large Scale Project: 5 ECTS**

#### **Learning outcomes**

Student is able to

- relate different details of engineering in a project
- carry out practical tasks in mechanical engineering
- carry out documentation
- work different roles in a project

### **AT00BX27 Steel Structures: 5 ECTS**

#### **Learning outcomes**

Student is able to

- design demanding steel constructions
- use steel construction norms in designing
- produce documents with chosen application

### **AT00BX28 Mechanical Vibrations: 5 ECTS**

#### **Learning outcomes**

Student is able to

- recognize basic details of vibrations in machine design

### **KONE21SLTI-1019 Mechanical engineering applications: 15 ECTS**

### **AT00BX29 Finite Element Method: 5 ECTS**

#### **Learning outcomes**

Student is able to

- recognize basic principles of machine elements
- use chosen application software in element design and matrix calculations

### **AT00BX30 Product Development and Innovations: 5 ECTS**

#### **Learning outcomes**

Student is able to

- use product development methods in design
- use creative ideas in product development
- recognize IPR rights in designing

**AT00BX31 Virtual Design Project: 5 ECTS****Learning outcomes**

Student is able to

- use simulation programs
- understand the possibilities of simulation softwares
- design and analyze moving structure

**KONE21SLTI-1014 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

**KONE21SLTI-1024 : 15 ECTS****AT00CG92 Advanced 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

**AT00CG94 Robotics Project: 5 ECTS****Learning outcomes**

Student is able to

- program robot application

**KONE21SLTI-1025 Production 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

**KONE21SLTI-1026 Smart production: 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

### **KONE21SLTI-1027 Individual learning path: 15 ECTS**

### **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

### **KONE21SLTI-1021 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 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

## **KONE21SLTI-1022 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.