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### Study programme "Adaptronics"

#### Main attributes

Title	Adaptronics
Identification code	ECA0
Education classification code	42522
Level and type	Professional Bachelor Study
Higher education study field	Power and Electrical Engineering, Electrical Technologies
Head of the study field	Oskars Krievs
Deputy head of the study field	Pāvels Gavrilovs
Department responsible	Faculty of Electrical and Environmental Engineering
Head of the study programme	Leonīds Ribickis
Professional classification code	215101
The type of study programme	Full time, Part time, Extramural
Language	Latvian, English
Accreditation	14.09.2022 - 15.09.2028; Accreditation certificate No 2022/21-A
Volume (credit points)	180.0
Duration of studies (years)	Full time studies - 4,5; Part time studies - 6,0; Extramural - 6,0
Degree or/and qualification to be obtained	Professional bachelor degree in adaptronics / electrical engineer
Qualification level to be obtained	The 6th level of European Qualifications Framework (EQF) and Latvian Qualifications Framework (LQF); the 6th level of professional qualification
Programme prerequisites	Secondary education

#### Description

Abstract	Modern technologies are complex systems that include elements of different areas: electrical engineering, electronics, mechatronics, adaptive materials, adaptive elements and systems, their regulation, and computer control. This, in turn, requires professionals employed who have knowledge not only of their main field of specialisation and adjacent industries, but also of sectors that seem far and unrelated to the main field, such as medicine or biology. At the same time, skills and competencies are needed to interact with each other. In this context, students and future specialists need knowledge and skills in the interdisciplinary sectors. During the studies, the students get the basic knowledge of theoretical and practical principles of electrical technologies, knowledge in the design of electrical equipment and devices, automation and practical realization of automation systems. The studies provide the knowledge and skills necessary to start practical work and technician, as well as to continue studies at the higher level of academic or professional master studies.
Aim	The general aim of the study programme is to provide professional training in the field of electrical engineering and electronics, as well as enable students to acquire the basic knowledge of electrical engineering, and to develop the necessary skills for the commencement of practical work. The aim of the study programme is to provide students with the opportunity to acquire theoretical and practical knowledge, develop professional, creative, and research skills in adaptronics, electrical engineering, electronics, mechatronics, adaptive materials, adaptronic elements and systems, their regulation and management, as well as facilitate the successful integration of students in the local and international labour market in a variety of industries and fields and prepares students for further studies at the professional master level in the respective area.
Tasks	Tasks of the study programme: - to provide knowledge of mathematics, physics, computing, biology, and materials science for solving practical tasks in electrical engineering; - to teach to use computer technology skilfully and efficiently in order to solve tasks, design automatic control devices, and develop adaptive systems; - to solve practical tasks in the field of electrical engineering at the project-oriented level; - to apply knowledge of the adaptive properties of the animals and plants in the design of modern electrical technologies; - to develop an understanding of the construction and operation principles of electrical equipment and automatic control systems; - to develop skills in solving practical electrical engineering automation tasks associated with the project design; - to develop an understanding of the energy efficiency of adaptronic equipment; - to develop an understanding and knowledge of work organisation and social issues of work, as well as the principles of economic operation and innovation; - to strengthen the knowledge of foreign languages.

Learning outcomes	<p>Upon completion of the study programme, the graduates are able:</p> <ul style="list-style-type: none"> <li>- to use theoretical knowledge of mathematics, physics, computing, biology, and materials science for solving practical tasks in the field of electrical engineering and electronics;</li> <li>- to use computer technology efficiently in order to solve tasks and design automatic control and adaptive systems;</li> <li>- to solve practical tasks of automatic control systems under specific conditions at the project level;</li> <li>- to recognise the adaptive properties of animals and plants that can be applied in electrical technologies;</li> <li>- to demonstrate an understanding of design, operation principles, and automatic control of electrical and electronic equipment;</li> <li>- to solve the adaptation tasks of electrical and electronic equipment under certain conditions at the project level;</li> <li>- to demonstrate an understanding of the aspects of energy efficiency and energy storage;</li> <li>- to demonstrate an understanding of the principles of work organisation, social and economic activity;</li> <li>- to study professional literature and exchange professional experience in foreign languages.</li> </ul>
Final/state examination procedure, assessment	<p>Bachelor Thesis with Project takes place at an open meeting of the State Examinations Commission, where the student defends his work and answers the questions asked by members of the commission, supervisor, reviewer and those present. The State Examination Commission appointed by the rector of RTU consists of five people: representatives of the Faculty of Electrical and Environmental Engineering, representatives of the industry and the chairman, Alnis Kaļāns (EK Sistēmas Ltd). The volume of the Bachelor Thesis with Project is 50 pages in a computer set with description and calculations, as well as two A1 drawing sheets with diagrams and solutions. The final evaluation of the Bachelor Thesis with Project is expressed in a 10-point evaluation system in accordance with the RTU Regulations of the Assessment of Learning Outcomes.</p>
Description of the future employment	<p>Graduates can work as electrical engineers at any enterprise, performing the duties connected with the maintenance, development and design of electrical technologies.</p>
Special enrollment requirements	-
Opportunity to continue studies	Graduates can continue studies at professional master study programmes.

Courses

No	Code	Name	Credit points
<b>A</b>		<b>Compulsory Study Courses</b>	<b>100.0</b>
<b>A.1</b>		<b>General Education Study Courses</b>	<b>15.0</b>
1	VAS038	Environment and Climate Roadmap	1.0
2	IDA700	Basics of Labour Protection	1.0
3	ICA301	Civil Defence	1.0
4	SDD700	Innovative Product Development and Entrepreneurship	6.0
5	BTG701	Fundamentals of Graphics Communication	2.0
6	EEI713	Introductive Course in Adaptronics	4.0
<b>A.2</b>		<b>Field-Specific Theoretical Basic and IT Study Courses</b>	<b>50.0</b>
1	DMF101	Mathematics	9.0
2	MFA101	Physics	6.0
3	ΚVΚ109	General Chemistry	2.0
4	MTM208	Robot Kinematics	3.0
5	EEE223	Fundamentals of Electrical Engineering Theory	6.0
6	EEE101	Electricity and Magnetism	2.0
7	EEI714	Elements of Adaptive Systems	4.0
8	EEP273	Basics of Regulation Theory	2.0
9	EEE215	Theory of Circuits	5.0
10	EEI726	Electrical Measurement Basics	3.0
11	EEM732	Numerical Methods for Computerization of Tasks in Electrical Engineering	2.0
12	EES744	Legal Framework for Energy Construction and Electricity Industries	1.0
13	EEI352	Programming languages	3.0
14	EES225	Basic Signal Theory	3.0
<b>A.3</b>		<b>Field-Specific Professional Study Courses</b>	<b>35.0</b>
1	EEI705	Design of Adaptive Systems	4.0
2	EEI500	Adaptive Processing of the Signals	3.0
3	EEI729	Power Electronics	4.0
4	EEP203	Digital Electronics (basic level)	4.0
5	EEI718	Industrial Sensors and Actuators	4.0
6	EEI710	Theory of Electrical Drive Systems	5.0
7	EEI348	Programming Technologies (study project)	2.0
8	EEP202	Control and Regulation of Electrical Drives	6.0
9	BÜK702	Adaptive Systems in Biology	3.0
<b>B</b>		<b>Compulsory Elective Study Courses</b>	<b>34.0</b>
<b>B1</b>		<b>Field-Specific Study Courses</b>	<b>26.0</b>
		<i>Industrial adaptronics</i>	<i>26.0</i>
1	EEI354	Adaptive Systems in Industrial Electronics	3.0
2	EEI355	Modern production technologies	5.0
3	DSP422	Artificial Intelligence	4.0
4	EEI725	Basics of Embedded Systems	3.0
5	EEI724	Embedded Systems (course project)	2.0
6	EEI720	Autonomous Robotic System (course project)	2.0
7	EEI358	Intelligent Electronic Equipment in Robotic Systems	3.0
8	EEI411	Fundamentals of Industrial Computer Networks	2.0
9	EEP342	Application of Computers in Electrical Equipment Design	2.0
		<i>Adaptronics in healthcare and medicine</i>	<i>26.0</i>
1	MEE711	Introduction to Medical Engineering	2.0
2	RR1598	Analysis of Biological Signals	5.0
3	MFB700	Smart Nanostructured Materials	3.0
4	MEE509	Medical Instrumentation	3.0
5	EEP342	Application of Computers in Electrical Equipment Design	2.0
6	EEI725	Basics of Embedded Systems	3.0
7	EEI719	Biological Robots (course project)	2.0
8	EEI724	Embedded Systems (course project)	2.0
9	DAA501	Computer Vision	4.0
		<i>Adaptronics in transport information systems</i>	<i>26.0</i>
1	EEI362	Internet of Things for Smart Electrical Technologies	3.0
2	EEI564	Computer Modelling of Intelligent Agents	6.0

3	<a href="#">EDE307</a>	Optimization Algorithms	3.0
4	<a href="#">EDE410</a>	Databases for Transportation Networks	2.0
5	<a href="#">EDE222</a>	WEB site design for transportation systems	2.0
6	<a href="#">EEI298</a>	Web technology and web-programming in electrical transport	2.0
7	<a href="#">EEI720</a>	Autonomous Robotic System (course project)	2.0
8	<a href="#">EEI388</a>	Artificial neural networks technology basics in electrical transport	2.0
9	<a href="#">EEI487</a>	Artificial immune systems and algorithms basics in electrical transport	2.0
10	<a href="#">EEI489</a>	Embedded Systems of Electrical Transport (study project)	2.0
<b>B2</b>		<b>Humanities and Social Sciences Study Courses</b>	<b>4.0</b>
1	<a href="#">IRO415</a>	Organization of Production	2.0
2	<a href="#">HSP377</a>	General Sociology	2.0
3	<a href="#">HSP379</a>	Political System of Latvia	2.0
4	<a href="#">IET103</a>	Economics	2.0
5	<a href="#">HPS120</a>	Basics of Communication	2.0
<b>B6</b>		<b>Languages</b>	<b>4.0</b>
1	<a href="#">HVD101</a>	The English Language	2.0
2	<a href="#">HVD216</a>	The English Language	2.0
3	<a href="#">HVD108</a>	The German Language	2.0
4	<a href="#">HVD119</a>	The French Language	2.0
<b>C</b>		<b>Free Elective Study Courses</b>	<b>6.0</b>
<b>D</b>		<b>Practical Placement</b>	<b>20.0</b>
1	<a href="#">EEI728</a>	Internship	20.0
<b>E</b>		<b>Final Examination</b>	<b>20.0</b>
1	<a href="#">EEI794</a>	Bachelor Thesis with Project	20.0