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### Study programme "Smart Electronic Systems"

#### Main attributes

Title	Smart Electronic Systems
Identification code	ECV0
Education classification code	42523
Level and type	Professional Bachelor Study
Higher education study field	Information Technology, Computer Engineering, Electronics, Telecommunications, Computer Control and Computer Science
Head of the study field	Agris Nikitenko
Deputy head of the study field	Jurģis Poriņš
Department responsible	Institute of Microwave Engineering and Electronics
Head of the study programme	Dmitrijs Pikuļins
Professional classification code	2152 01
The type of study programme	Full time
Language	Latvian, English
Accreditation	31.05.2013 - 31.12.2023; Accreditation certificate No 2020/80
Volume (credit points)	160.0
Duration of studies (years)	Full time studies - 4,0
Degree or/and qualification to be obtained	professional bachelor's degree in electrical engineering and qualification of electronics 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	general or vocational secondary education

#### Description

Abstract	The professional higher education bachelor's study programme prepares specialists - engineers who are able to work in the field of development, installation, operation, and research of smart electronic systems. The professional specialization study courses of the study programme are combined in four modules: smart embedded systems, signal processing, and wireless communication systems, analog and radio frequency (RF) equipment and systems, electronic hardware design. The study program develops students' professional competence in digital and analog system design, embedded system and field-programmable gate array (FPGA) programming, analog and discrete signal processing, implementation of modern wireless communication systems, electromagnetic field analysis, and antenna design.
Aim	To provide professional bachelor's level education in the field of electronics, preparing specialists who understand the development trends of the field and are able to work in the field of analysis and development of smart electronic systems, as well as to prepare for further studies in academic or professional master's study programs.
Tasks	The tasks of the study programme are as follows: <ul style="list-style-type: none"> <li>• to provide competitive education in accordance with the level of professional bachelor studies and international standards in the field of electronic systems;</li> <li>• to develop and strengthen the foundations of fundamental sciences necessary for the acquisition of theoretical study courses in the field;</li> <li>• to ensure the acquisition of basic theoretical study courses in the field of electronics at the level necessary for the acquisition of specialized study courses and innovations in the field;</li> <li>• to ensure the acquisition of specialized knowledge characteristic to the study field and the ability to apply it for the formulation and solution of tasks in various types of smart electronic systems;</li> <li>• to provide students with knowledge about the use of computer tools in the analysis, programming, modeling and design of electronic systems;</li> <li>• to ensure the development and changes of the content of the study program, implementation of the study process, scientific research work, in accordance with changes in the fields of electronic system design, international practice, science;</li> <li>• to provide students with comprehensive knowledge and develop competence in accordance with the requirements of the market for electronics engineers, preparing students for practical work in the design and maintenance of smart electronic systems;</li> <li>• to develop students' skills to obtain, select and analyze the information necessary for the implementation of professional activities, as well as to use them for decision-making and solving the problems of the respective field;</li> <li>• to provide students with the basics of professional ethics, allowing to assess the impact of professional activities on the environment and society;</li> <li>• to promote students' interest in further professional development by providing knowledge and skills for independent studies to increase their academic and professional qualifications.</li> </ul>

Learning outcomes	<p>Graduates of the study programme:</p> <ul style="list-style-type: none"> <li>• knows the content of the basic theoretical study courses in the field of electronics at the level necessary for the acquisition of specialized study courses and innovations in the field;</li> <li>• is able to work with scientific, technical and methodological literature available in English;</li> <li>• is able to use theoretical knowledge to formulate and solve specific tasks in the fields related to smart electronic systems;</li> <li>• is able to perform experimental data processing in the analysis of electronic circuitry and system operation features;</li> <li>• is able to develop circuits of digital, analog and RF electronic equipment and systems, make prototypes, perform their testing, analysis, and improvement;</li> <li>• is able to systematize information related to professional activities, to summarize, interpret and analyze the results of measurements and calculations, to prepare summarized reports;</li> <li>• is able to apply current technologies and software to the design process of smart electronic systems;</li> <li>• is able to design electronic equipment and systems, perform their operation modeling, management software development;</li> <li>• is able to develop printed circuit boards and corresponding technical documentation;</li> <li>• knows at the level of understanding standards and technical regulations of the electronics industry;</li> <li>• knows at the level of understanding the principles of wireless communication system design;</li> <li>• knows at the application level electrodynamics and antenna theory;</li> <li>• is familiar at the application level with analog and digital circuitry;</li> <li>• knows at the application level the theory of analog and discrete signal processing;</li> <li>• knows at the application level the programming of microcontrollers, programmable logic circuits in high-level languages ;</li> <li>• understands the importance of lifelong learning, is able to plan and implement their professional development.</li> </ul>
Final/state examination procedure, assessment	<p>The programme is concluded with the state examination, where the elaboration and defence of a bachelor's thesis including a project in a public session of the State Examination Commission (SEC) is a constituent part of this examination. At the same time, the acquisition of key fundamental, theoretical and field-specific professional knowledge is tested.</p> <p>The SEC consists of at least five members. The chair and at least half of the panel are composed of representatives of professional organisations or employers from the industry. Students' knowledge, skills and competence are assessed collegially by the SEC on a 10-grade scale.</p>
Description of the future employment	<p>AS "SAF Tehnika", SIA "Mikrotīkls", VAS "Latvijas Valsts Radio un Televīzijas Centrs", SIA "Lattelekom", SIA "TET", SIA "Latvijas Mobilais Telefons", SIA "Tele2", VAS "Elektroniskie sakari", AS "Alfa", AS "HansaMatrix", SIA "HansaMatrix Innovation", Accenture Latvijas filiāle, SIA "UAVFactory", SIA "Citrus Solutions", AS "Draugiem Group", SIA "Intelligent Systems", SIA "AERONES", SIA "Vizulo", SIA "Regula Baltija", SIA "Baltic Scientific Instruments".</p>
Special enrollment requirements	<p>The English language proficiency assessment.</p>
Opportunity to continue studies	<p>Graduates of the study programme can continue their studies in master's study programmes, for example, in the professional master's study programme "Smart Electronic Systems".</p>

Courses

No	Code	Name	Credit points
<b>A</b>		<b>Compulsory Study Courses</b>	<b>84.0</b>
<b>A.1</b>		<b>General Education Study Courses</b>	<b>15.0</b>
1	RDE710	Introduction to Electronics and Telecommunications Branch	4.0
2	SDD700	Innovative Product Development and Entrepreneurship	6.0
3	REA708	Research Seminars in the Field of Electronics	2.0
4	ICA105	Civil Defence	1.0
5	IDA700	Basics of Labour Protection	1.0
6	VAS038	Environment and Climate Roadmap	1.0
<b>A.2</b>		<b>Field-Specific Theoretical Basic and IT Study Courses</b>	<b>38.0</b>
1	DMF101	Mathematics	9.0
2	DIM205	Supplementary Mathematics (for electrical engineering)	2.0
3	DMS212	Probability Theory and Mathematical Statistics	2.0
4	MFA101	Physics	6.0
5	REA103	Fundamentals of Materials Science	2.0
6	RTR207	Computerization of Mathematical Tasks in Electrical Engineering	3.0
7	RTR805	Fundamentals of DC Circuits	2.0
8	RAE261	Digital Electronics and Computer Architecture	3.0
9	RTR806	Fundamentals of AC Circuits	3.0
10	RRE102	Electricity and Magnetism	2.0
11	RTR807	Circuit Theory (special course)	4.0
<b>A.3</b>		<b>Field-Specific Professional Study Courses</b>	<b>31.0</b>
		<i>Smart Embedded Systems</i>	
1	REA713	Embedded Systems Architecture and Peripherals	3.0
2	REA714	Embedded Systems Architecture and Peripherals (study project)	2.0
		<i>Signal Processing and Wireless Communication Systems</i>	
1	RTR822	Signal Theory	3.0
2	RTR823	Signal Theory (study project)	2.0
3	RRI324	Digital Signal Processing	2.0
4	RRI713	Digital Signal Processing (study project)	2.0
		<i>Analog and RF Equipment and Systems</i>	
1	REA204	Electron Devices	3.0
2	REA709	Active Electronic Systems	3.0
3	RTR707	Analogue Electronics	5.0
4	RTR820	Electrodynamics and RF Devices	3.0
		<i>Electronic Hardware Design</i>	
1	RTR701	Laboratory Exercises in Electronics	3.0
<b>B</b>		<b>Compulsory Elective Study Courses</b>	<b>38.0</b>
<b>B.1</b>		<b>Field-Specific Study Courses</b>	<b>30.0</b>
		<i>Smart Embedded Systems</i>	
1	EAP301	Electronic Control System Design	4.0
2	REA711	Fundamentals of Digital Electronic Systems Design using HDL	3.0
3	REA712	Fundamentals of Digital Electronic Systems Design using HDL (study project)	2.0
4	TRT461	The C Programming Language	2.0
5	RAE362	Digital Devices and Systems	3.0
6	RTR105	Computer Studies (basic course)	3.0
7	DST712	Internet of Things Technologies	2.0
		<i>Signal Processing and Wireless Communication Systems</i>	
1	RTR800	Fundamentals of Smart Radio	3.0
2	RTR825	Fundamentals of Smart Radio (study project)	2.0
3	RDE706	Transmission Systems	6.0
		<i>Analog and RF Equipment and Systems</i>	
1	RRI349	Analogue and Digital Integrated Circuits	3.0
2	RTR821	Antenna Design	3.0
3	RTR824	Antenna Design (study project)	2.0
		<i>Electronic Hardware Design</i>	
1	RDE709	Electrical Measurements in Telecommunications	4.0
2	RRI405	Electroacoustics	2.0
3	REA710	Design of Printed Circuit Boards	4.0

4	RRI708	Design and Documentation of Electronic Equipment	3.0
5	REA502	Electromagnetic Compatibility: Components and Applications	3.0
<b>B2</b>		<b>Humanities and Social Sciences Study Courses</b>	<b>4.0</b>
1	HSP380	United Europe and Latvia	2.0
2	HFL336	Basic Ethics	2.0
3	HSP379	Political System of Latvia	2.0
4	IRO415	Organization of Production	2.0
5	HSP375	Sociology of Management	2.0
<b>B6</b>		<b>Languages</b>	<b>4.0</b>
1	HVD101	The English Language	2.0
2	HVD415	The German Language	4.0
3	HVD216	The English Language	2.0
4	VSL711	Latvian for Foreign Students	1.0
5	HVD104	The English Language	3.0
<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	RRI712	Practical Placement	20.0
<b>E</b>		<b>Final Examination</b>	<b>12.0</b>
1	RTR711	Bachelor Thesis Including Project	12.0