

DESCRIPTION OF THE PROGRAM OF STUDIES**Main field of study ...** Electronic and computer engineering**Profile** general academic**Level of studies**first.....**Form of studies ...**stationary...**1. General description**

<i>1.1 Number of semesters: 7</i>	<i>1.2 Total number of ECTS points necessary to complete studies at a given level: 210</i>
<i>1.3 Total number of hours: 2565</i>	<p><i>1.4 Prerequisites (particularly for second-level studies):</i></p> <p><i>The competition of grades from maturity certificate and certificate of secondary school.</i></p> <p><i>In case of foreign students, secondary school certificate, received after the completion of a recognized secondary school (total 12 years of education), being the equivalent of Polish maturity certificate accepted by Kuratorium Oświaty.</i></p> <p><i>Detailed requirements are stated by the Senate of Wrocław University of Technology and the Faculty of Electronics Council every year</i></p>

<p>1.5 Upon completion of studies graduate obtains professional degree of: ...Engineer.....</p>	<p>1.6 Graduate profile, employability:</p> <p><i>Undergraduate studies are not divided into specializations. They enable to get primary and organized knowledge in the field of electronics, automation and robotics, and computer science. After graduation, the graduate will be able to:</i></p> <ul style="list-style-type: none"> • <i>To design, implement, test and operate analog, digital and mixed signal electronic circuits with the use of electronic components and optoelectronic integrated circuits and microprocessors, plan and design circuits and systems, optimize measurement conditions and to analyze and interpret the test results.</i> • <i>Use personal computing for the acquisition of measurement results, technological process control, design, commissioning, maintenance of automation and industrial robotics exchange of information based on standard data protocols.</i> <p><i>To solve computing tasks using computer tools, prepare, execute, and analyze computer simulations and experiments, make by yourself computer programs, including programs for implementation of DSP algorithms.</i></p>
<p>1.7 Possibility of continuing studies:</p>	<p>1.8 Indicate connection with University's mission and its development strategy:</p>

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- Second-cycle studies in the fields of Electronics, Automation and Robotics, Computer Science, Telecommunications and related fields.

The program is consistent with the Electronic Faculty Development Plan established by the Faculty Council on 22nd February 2012.

The Faculty Development Plan is fully correlated with the university's mission and its development strategy adopted by the Senate of Wrocław University of Technology in 2011. The relations are apparent for example in par. 3 of the Development Plan "Faculty Mission and Perspectives" and in par. 4 "Sector Models", where the Educational Model and Study Model are described, together with the Model for External Cooperation that considers job opportunities and forming of the network of influence

2. Detailed description

2.1 Total number of learning outcomes in the program of study: W (knowledge) = 12., U (skills) = 13., K (competences) = .5....., W + U + K =30....

**2.2 For the main field of study assigned to more than one discipline - the number of learning outcomes assigned to the discipline:
nd**

**2.3 For the main field of study assigned to more than one discipline - percentage share of the number of ECTS points for each discipline:
nd**

2.4a. For the general academic profile of the main field of study – the number of ECTS points assigned to the classes related to the University's academic activity in the discipline or disciplines to which the main field of study is assigned – DN (must be greater than 50% of the total number of ECTS points from 1.2) .. 205 ECTS..

2.4b. For the practical profile of the main field of study - the number of ECTS points assigned to the classes shaping practical skills (must be greater than 50% of the total number of ECTS points from 1.2)

2.5 Concise analysis of compliance of the assumed learning outcomes with the needs of the labor market

The work market for engineering graduates majoring in Electronic and Computer Engineering (ECE) covers the whole country, region of Lower Silesia and Wrocław. The program of study covers all the basic needs and requirements of the work market for electronics and computer engineers. Profile of the companies that will benefit from the competence of graduates is mainly manufacturing and service

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companies. In this area, there is and will be a significant demand for professionals with the title of electronics engineer, possessing the skills of integration of the electronic equipment and analogue and digital systems (including microprocessor) in broadly covered industrial automation. These skills include, among others, PLC programming, PAC, SCADA systems and robotic systems, conduct commissioning of control systems, local and remote maintenance, supervision over operating control systems of production. Also the ability to design broadly defined control systems, telemetry systems and the measurement will be on the work market received very positively. Currently there is a significant increase in the number of companies specializing in buildings and homes automation. These objects require care and conservation engineers. In the Lower Silesia region operates a significant number of small and medium-sized enterprises and factories, where engineering skills are and will find appreciation in the period of many years to come.

An additional advantage of graduates will be the practical knowledge of English, which will expand its opportunities in the growing number of foreign companies with their research and development and / or production facilities in the Lower Silesia and the whole Poland.

2.6. The total number of ECTS points that a student must obtain in classes requiring direct participation of academic teachers or other persons conducting classes and students (enter the sum of ECTS points for courses / groups of courses marked with the BU¹ code) .
109,5. ECTS

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2.7. Total number of ECTS points, which student has to obtain from basic sciences classes

Number of ECTS points for obligatory subjects	25
Number of ECTS points for optional subjects	
Total number of ECTS points	25

2.8. Total number of ECTS points, which student has to obtain from practical classes, including project and laboratory classes (enter total number of ECTS points for courses/group of courses denoted with code P)

Number of ECTS points for obligatory subjects	71
Number of ECTS points for optional subjects	59
Total number of ECTS points	130

2.9. Minimum number of ECTS points, which student has to obtain doing education blocks offered as part of University-wide classes or other main field of study (enter number of ECTS points for courses/groups of courses denoted with code O)

...35. ECTS points

2.10. Total number of ECTS points, which student may obtain doing optional blocks (min. 30% of total number of ECTS points)

...83. ECTS points

3. Description of the process leading to learning outcomes acquisition:

While following the curriculum, students attend organised classes. In accordance with the rules of higher education at Wrocław University of Technology, students are obliged to participate in classes. Classes are conducted in the forms specified in the study regulations, using both traditional methods and The e-learning platform is used as well as traditional methods and didactic tools. Outside class time, instructors are

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available for students in the following times Outside of class hours, instructors are available for students during designated and announced on the Faculty website consultation hours.

An important element of learning is the student's own work, which consists in preparing preparation for classes (on the basis of materials provided by Tutors, as well as the recommended literature), literature studies, preparation of reports and reports, preparing for colloquia and examinations. Each PRK learning outcome is assigned a course code present in the study programme. The passing of these courses (this course) means obtaining the given effect. The courses are passed on the basis of the forms of control of the acquired knowledge, skills and social competences defined in the course charter. Failure of a student to achieve

The student's failure to achieve the learning outcomes assigned to the course will result in failing the course and having to repeat it.

As part of the study programme, students complete student work placement of no less than 160 hours. In-service training is carried out in a company. The basis for the student to receive credit for the internship is a confirmation of the internship. The basis for the completion of the in-service training is the confirmation of its completion and a positive assessment by the employer.

The passing of the in-service training is a confirmation of the realization of the learning outcomes ascribed to it. The completion of each semester of studies is conditional on obtaining the number of ECTS credits specified in the study programme. The completion of each semester of studies is conditional on obtaining the number of ECTS credits specified in the study programme, which is equivalent to achieving the majority of The completion of each semester of study is conditional on the number of ECTS credits specified in the study programme. Courses not passed must be repeated in subsequent semesters, thus achieving the remaining learning outcomes. learning outcomes.

Successful completion of the studies is possible after the student has achieved all the learning outcomes specified in the study programme. The quality of the classes conducted and the achievement of learning outcomes are controlled by the Departmental Educational Quality Assurance System, which includes, among other things, procedures for developing and modifying curricula, individualising study programmes, conducting the teaching process and graduation.

Quality control of the education process includes evaluation of the learning outcomes achieved by the students. Quality control of conducted classes is supported by hospitalizations and surveys, conducted according to strictly defined departmental procedures.

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4. List of education blocks:

4.1. List of obligatory blocks:

4.1.1 List of general education blocks

4.1.1.1 *Liberal-managerial subjects block (min. ECTS points):*

4.1.1.2 *Foreign languages block (min. ECTS points):*

4.1.1.3 *Sporting classes block (0 ECTS points):*

4.1.1.4 *Information technologies block (min. ECTS points):*

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	ECEA00002	Introduction to Programming GK	2		3			K1EAC_W03 K1EAC_U03	75	240	8	8	6	T	Z(lec)			4	KO
Total			2	0	3	0	0	-	75	240	8	8	6	-	-	-	-	4	-

Altogether for general education blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
2	0	3	0	0	75	240	8	8	6

4.1.2 List of basic sciences blocks

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4.1.2.1 Mathematics block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	MAT001509	Math - Analysis 1 GK	2	2				KIEAC_W01 KIEAC_U01	60	240	8	8	2	T	E(lec)	O		3	PD
2	MAT001511	Math - Analysis 2 GK	2	2				KIEAC_W01 KIEAC_U01	60	150	5	5	2	T	E(lec)	O		2	PD
3	MAT001510	Math - Algebra GK	2	2				KIEAC_W01 KIEAC_U01	60	240	8	8	2	T	E(lec)	O		3	PD
Total			6	6	0	0	0	-	180	630	21	21	6	-	-	-	-	8	-

4.1.2.2 Physics block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	FZP001127	Physics GK	2		2			KIEAC_W02 KIEAC_U02	60	180	6	6	2	T	E(lec)	O		3	PD
Total			2	0	2	0	0	-	60	180	6	6	2	-	-	-	-	3	-

4.1.2.3 Chemistry block

Altogether for basic sciences blocks:

Total number of hours	Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹

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lec	cl	lab	pr	sem					
8	6	2	0	0	240	810	27	27	8

4.1.3 List of the main field of study blocks

4.1.3.1 Obligatory main field of study blocks

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	MAT001512	Math for Electronics GK	2	2			KIEAC_W01 KIEAC_U01	60	120	4	4	2	T	Z(lec)			2	PD	
2	ECEA00014	Physics for Electronics GK	2	2			KIEAC_W02 KIEAC_U02	60	180	6	6	2	T	Z(lec)			3	PD	
3	ECEA17004	Object oriented programming GK	2		2		KIEAC_W03 KIEAC_U03	60	150	5	5	3	T	E(lec)			3	PD	
4	ECEA00007	Scientific_and_Engineering_Program ming GK	2		2		KIEAC_W03 KIEAC_U03	60	150	5	5	2	T	Z(lec)			3	K	
5	ECEA00010	Programming Systems & Environments GK	2		2		KIEAC_W03 KIEAC_U03	60	120	4	4	2	T	Z(lec)			2	K	
6	ECEA00001	Metrology GK	1	1	2		KIEAC_W02 KIEAC_U02	60	120	4	4	2	T	Z(lec)			3	K	
7	ECEA00003	Electronics GK	3	3	2		KIEAC_W04 KIEAC_U04	120	240	8	8	4	T	Z(lec)			5	K	
8	ECEA00016	Electronic_Components_and_Sensors GK	3	1	2		KIEAC_W04 KIEAC_U04	90	240	8	8	3	T	E(lec)			5	K	
9	ECEA00006	Electronic_Technology GK	2		2		KIEAC_W04 KIEAC_U04	60	150	5	5	3	T	Z(lec)			3	K	
10	ECEA00009	Electronic_circuits GK	2		2	2	KIEAC_W04 KIEAC_U04	90	240	8	8	4	T	E(lec)			5	K	
11	ECEA00022	Introduction_to_Microcontrollers GK	3		2	1	KIEAC_W07 KIEAC_U07	90	240	8	8	5	T	E(lec)			4	K	
12	ECEA00101	Computer_Networks GK	2		2		KIEAC_W11	60	120	4	4	2	T	Z(lec)			2	K	

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								KIEAC_U11											
13	ECEA00025	Python GK	1	1				KIEAC_W03 KIEAC_U03	30	90	3	3	2	T	Z(lec)			2	K
14	ECEA00019	Introduction to Automation GK	2		1			KIEAC_W05 KIEAC_U05	45	90	3	3	2	T	Z(lec)			2	K
15	ECEA00020	Introduction to Robotics GK	2		1			KIEAC_W05 KIEAC_U05	45	90	3	3	2	T	Z(lec)			2	K
16	ECEA19202	Microcontrollers GK	2		2	1		KIEAC_W07 KIEAC_U07	75	150	5	5	4	T	E(lec)			3	K
17	ECEA00021	Fundamentals_of_Telecommunication GK	2		2			KIEAC_W06 KIEAC_U06	60	120	4	4	2	T	Z(lec)			2	K
18	ECEA00103	Electroacoustics GK	2		2			KIEAC_W12 KIEAC_U12	60	120	4	4	2	T	Z(lec)			2	K
Total			37	10	28	4		-	1185	2730	91	91	48	-	-	-	-	53	-

Altogether (for main field of study blocks):

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
37	10	28	4		1185	2730	91	91	48

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4.2 List of optional blocks

4.2.1 List of general education blocks

4.2.1.1 Liberal-managerial subjects blocks (min. ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	FLEA00100	Philosophy	2					K1EAC_K01	30	60	2	2	1	T	Z	O		0	KO
2	PRZ000339	Copyright	2					K1EAC_K02	30	60	2	2	1	T	Z	O		0	KO
3	ZMZ001048	Entrepreneurship	2					K1EAC_K03	30	30	1	1	1	T	Z	O		0	KO
Total			6	0	0	0	0	-	90	150	5	5	3	-	-	-	-	0	-

4.2.1.2 Foreign languages block (min. ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	From the university pool	Foreign language - A1/A2/B1/B1.2/C1.1		4				K1EAC_U13	60	60	2		1,5	T	Z	O		2	KO
2	From the university pool	Foreign language – B2.1/C1.2		4				K1EAC_U14	60	90	3		2,5	T	Z	O		3	KO
Total			0	8	0	0	0	-	120	150	5		4	-	-	-	-	5	-

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4.2.1.3 Sporting classes block (0. ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	From the university pool	Sport		4				KIEAC_K05	60		0		0	T	Z	O		0	KO
Total			0	4	0	0	0	-	60	0	0		0	-	-	-	-	0	-

4.2.1.4 Information technologies block (min. ECTS points): only the obligatory course

Altogether for general education blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
6	4	8	0	0	270	300	10	5	7

4.2.2 List of basic sciences blocks

4.2.2.1 Mathematics block (min. ECTS points): only the obligatory courses

4.2.2.2 Physics block (min. ECTS points): only the obligatory courses

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4.2.2.3 Chemistry block (min. ECTS points): none

4.2.3 List of blocks

4.2.3.1 Block 1 (SEMESTER 5 – 3 out of 5) (min. ..21 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	ECEA00201	Advanced Topics in Robotics GK	2			2	1	KIEAC_W05 KIEAC_U05	75	210	7	7	4	T	Z(lec)			4	K
2	ECEA00102	Digital Signal Processing GK	2		3			KIEAC_W07 KIEAC_U07	75	210	7	7	4	T	Z(lec)			4	K
3	ECEA00203	Artificial Intelligence and Computer Vision GK	2		2	1		KIEAC_W03 KIEAC_U03	75	210	7	7	4	T	Z(lec)			4	K
4	ECEA00204	Optoelectronics GK	2			2	1	KIEAC_W12 KIEAC_U12	75	210	7	7	4	T	Z(lec)			4	K
5	ECEA00205	Wireless systems GK	3		2			KIEAC_W06 KIEAC_U06	75	210	7	7	4	T	Z(lec)			4	K
Total (3 out of 5)			11	0	7	5	2	-	225	630	21	21	12	-	-	-	-	12	-

4.2.3.2 Block 2 (SEMESTER 6 – 3 out of 5) (min. ..21 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	ECEA00206	Control Systems Engineering GK	2		3			KIEAC_W05 KIEAC_U05	75	210	7	7	4	T	E(lec)			4	K

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³Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

⁴University-wide course /group of courses – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

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2	ECEA00207	Embedded Systems GK	2		2	1		KIEAC_W07 KIEAC_U07	75	210	7	7	4	T	E(lec)			4	K
3	ECEA00208	Real Time Operating Systems GK	2			3		KIEAC_W03 KIEAC_U03	75	210	7	7	4	T	E(lec)			4	K
4	ECEA00209	Lasers, Fibers and Applications GK	2		2		1	KIEAC_W12 KIEAC_U12	75	210	7	7	4	T	E(lec)			4	K
5	ECEA00210	Communication systems and networks GK	2		2		1	KIEAC_W06 KIEAC_U06	75	210	7	7	4	T	E(lec)			4	K
Total (3 out of 5)			10	0	9	4	2	-	225	630	21	21	12	-	-	-	-	12	-

4.2.3.3 Block 3 (SEMESTER 7 – choice of 2) (min. ..6 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	ECEA00211	Electrotechnics GK	2		1			KIEAC_W04 KIEAC_U04	45	90	3	3	1,5	T	Z(lec)			1	K
2	ECEA00212	Medical Electronics GK	2				1	KIEAC_W04 KIEAC_U04	45	90	3	3	1,5	T	Z(lec)			1	K
3	ECEA00214	Electronics for Renewable Energy Sources GK	2				1	KIEAC_W02 KIEAC_U02	45	90	3	3	1,5	T	Z(lec)			1	K
4	ECEA00216	Virtualization and Cloud Computing GK	1		2			KIEAC_W03 KIEAC_U03	45	90	3	3	1,5	T	Z(lec)			1	K
5	ECEA00217	Machine learning GK	1			2		KIEAC_W03 KIEAC_U03	45	90	3	3	1,5	T	Z(lec)			1	K
6	ECEA00218	Selected topics in Artificial Intelligence GK	2		1			KIEAC_W03 KIEAC_U03	45	90	3	3	1,5	T	Z(lec)			1	K
7	ECEA00220	Ultrasonic technology GK	1		2			KIEAC_W02 KIEAC_U02	45	90	3	3	1,5	T	Z(lec)			1	K
8	ECEA00221	Speech communication GK	1		2			KIEAC_W02 KIEAC_U02	45	90	3	3	1,5	T	Z(lec)			1	K

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9	ECEA00223	Introduction to Radar Technology GK	2				1	KIEAC_W02 KIEAC_U02	45	90	3	3	1,5	T	Z(lec)			1	K
Total (choice of 2)			14	0	8	2	3	-	90	180	6	6	3	-	-	-	-	2	-

4.2.3.4 Other courses (min. ..26 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of course/gr oup of courses	Way ³ of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University -wide ⁴	Concerni ng scientific activities ⁵	Practical ⁶	Type ⁷
1	ECEA00106	Team & preengineering project			3			KIEAC_K04	75	150	5	5	2,5	T	Z			5	K
2	ECEA17105	Diploma seminar					2	KIEAC_U08	30	60	2	2	1	T	Z			3	K
3	ECEA17100	Final project			12			KIEAC_U08		360	12	12	3	T	E			12	K
4	ECEA16001Q	Internship						KIEAC_U08		180	6	6	6	T	Z			6	K
Total			0	0	15	0	2	-	105	750	25	25	12,5	-	-	-	-	26	-

Altogether for blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
					645	2190	73	73	39,5

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4.2.4 List of specialization blocks

4.2.4.1 *Specialization subjects (e.g. whole specialization) blocks (min. ECTS points):*

4.2.4.2(e.g. *diploma profile*) block (min. ECTS points):

Altogether for specialization blocks:

4.3 Training block - concerning principles of training crediting – attachment no. ...

Opinion of the Advisory Faculty Council concerning the rules of crediting training block

Name of training		professional	
Number of ECTS points	Number of ECTS points for BU¹ classes	Training crediting mode	Code
6	6	Mark	ECEP16001Q
Training duration		Training objective	
4 weeks (160 hours)		Acquiring effect K1_EAC_U04	

4.4 „Diploma dissertation” block (if it is foreseen at first level studies)

Type of diploma dissertation	inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code

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1	12	ECEA17100
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BU¹ ECTS points	3	
Number of DN ECTS points	12	

5. Ways of verifying assumed learning outcomes

Type of classes	Ways of verifying assumed learning outcomes
lecture	e.g. examination, progress/final test
class	e.g. progress/final test
laboratory	e.g. pretest, report from laboratory
project	e.g. project defence
seminar	e.g. participation in discussion, topic presentation, essay
training	e.g. report from training
diploma dissertation	prepared diploma dissertation

6. Range of diploma examination

- 1) Systematics and characteristics of direct methods of measurement and of methods for assessing measurement accuracy
- 2) Basic theorems in electronic circuits: Thevenin, Norton, superposition and power matching theorems. Application of Laplace transform in circuit analysis.
- 3) Principles of object-oriented design and their impact on software quality. Compare the structural and object-oriented approaches of software development.
- 4) Bipolar and unipolar transistors -structure, properties and applications. Fundamentals of analog signal conditioning.
- 5) Printed circuit boards – substrates, layers, rules. Elements of cooling system of electronic devices
- 6) What is an operational amplifier? Discuss its characteristic parameters. Give examples of applications. Construction and operation of PLL loops. Give examples of applications.
- 7) Problems of concurrent thread/process synchronization: synchronization criteria, available mechanisms, an example of the synchronization problem. Elements of object orienting programming in Java.

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- 8) Basic telecommunication system: block diagram, coder/decoder, modulation/demodulation, Signal-to-Noise ratio
- 9) Describe techniques for optimization of logic equations. Microcontroller – describe main elements and how it works
- 10) Basic tasks of robotics: definition, solution techniques. Principles of modeling and models of wheeled mobile robots.
- 11) Enumerate and describe components of typical control loop. Describe operating principle and taxonomy of automatic controllers
- 12) Describe the ISO/OSI reference model and explain the principles of layered approach. Explain the differences between IPv4 and IPv6.
- 13) Acoustic waves - types, properties, equation. Electroacoustical chain. Distortions and disturbances
- 14) The physical basis of light amplification in lasers. Thermal and photonic detectors of light.
- 15) Describe main functionalities of a standard microcontroller's timer. How ADC works? What is meant by sampling, quantizing and encoding?
- 16) Describe functional model of ARM microcontrollers. How the ARM microcontrollers stand against main families of 8-bit microcontrollers. Programming, debugging, tracing – explain what is meant by those terms and how are they realized in contemporary microcontrollers.

- 17) *Discrete linear systems - the importance, a mathematical model, time and frequency properties of the model. Quadrature sampling scheme - Hilbert transform, analytical signal, quadrature sampling applications
- 18) *Methods of task and motion planning for stationary and mobile robots. Methods of localization and environment mapping for mobile robots
- 19) *Probabilistic knowledge representation and decision making methods. Low-level image processing algorithms - examples, applications
- 20) *Building management systems (BMS): architecture, equipment, communication protocols, Redundancy, High Availability and Safety Related aspects in Distributed Control Systems
- 21) *The review of lasing media. Describe one of chosen type of laser, its basic parameters and give an example of its application
- 22) *Wireless and radio systems: classification, applications, used frequency bands, network architectures and functions of individual
- 23) *HDL Hardware Description Languages: Verilog and VHDL. Components of the language. The structure of the code
- 24) * Discuss the most important differences between the RTOS (Real-time Operating Systems) and the GPOS (General-purpose Operating Systems); consider the API, scheduler, services, and drivers.

*) During diploma dissertation 4 out of 8 questions shall be chosen depending on the realized set of Optional Courses 1 and 2.

7. Requirements concerning deadlines for crediting courses/groups of courses for all courses in particular blocks

<i>No.</i>	<i>Course / group of courses code</i>	<i>Name of course / group of courses</i>	<i>Crediting by deadline of... (number of semester)</i>
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1		<i>All courses/groups of courses from the plan of studies for semester 1 and semester 2</i>	5
2	<i>ECEP16001Q</i>	<i>Intership</i>	6

8. Plan of studies (attachment no.)

Approved by faculty student government legislative body:

.....
Date name and surname, signature of student representative

.....
Date Dean's signature

*delete as appropriate

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