

## DESCRIPTION OF THE PROGRAM OF STUDIES

### 1. Description

1.1 Number of semesters: 4	1.2 Total number of ECTS points necessary to complete studies at a given level: 120
1.3 Total number of hours: 1440	1.4 Prerequisites (particularly for second-level studies): Completed undergraduate or graduate degree in the field, in which contents of Electrical Engineering related to Circuit Theory and Theory of Electromagnetic Field are contained as well as knowledge gained from at least one of the courses: Electrical Drives, Electrical Devices, Fundamentals of Control Theory, High Voltage Engineering.
1.5 Upon completion of studies graduate obtains professional degree of: master of science, engineer	1.6 Graduate profile, employability: A graduate of English-language specialty of the second cycle in the energy control (Control in Electrical Power Engineering) has an advanced and well-established knowledge of the techniques of control and protection of power systems. He has also the ability to use tools for analysis of the distribution systems and the design of control systems. He is capable of creative work and to make decisions and lead teams labor. He is prepared to continue his education in Doctoral School in domestic and foreign universities.
1.7 Possibility of continuing studies: Doctoral School	1.8 Indicate connection with University's mission and its development strategy: The knowledge gained during studies should not only lead to success in the future careers of the graduate, but also shape a creative man with a sense of entrepreneurs, open to new challenges.

**2. Detailed description:**

**2.1 Total number of learning outcomes in the program of study:**

**W (knowledge) = 23**

**U (skills) = 26**

**K (competences) = 7**

**W + U + K = 56**

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

**D1 (major): 56**

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

**D1 100 % ECTS points**

**2.4a. For the general academic profile 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 faculty is assigned:**

112 ECTS

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

*Learning outcomes refer not only to the large sense of electrical engineering, in particular to automation and control in power systems, but - due to the demands of modern techniques and technologies currently used in power generation and industry – but also to the electronics, power electronics and microprocessor technology, computer science and management techniques and marketing. Obtaining the intended learning outcomes will enable graduates to find attractive and interesting work in the energy sector of the national economy, particularly in units where are designed and manufactured systems and control systems for the power industry. It is also ready to start a business in the electrical industry. Work on learning outcomes were refereed and discussed at the meetings of the Convention of the Faculty of Electrical Engineering, which includes, among others, representatives of industrial enterprises of the Polish territory, with particular consideration to Lower Silesia and the neighbouring provinces. The Convention also includes foreign members. At these meetings were presented and explained the needs of the labour market.*

## 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 BK1 code)

84 ECTS

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

Number of ECTS points for obligatory subjects	7
Number of ECTS points for optional subjects	0
Total number of ECTS points	7

## 2.8. Total number of ECTS points, which student has to obtain from practical classes, including laboratory classes

Number of ECTS points for obligatory subjects	26
Number of ECTS points for optional subjects	40
Total number of ECTS points	66

## 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

8 ECTS points

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

48 ECTS points

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

*Teachers delivering the individual courses during the first lecture present the aim and program of the respective course as well as explain the assumed teaching outcomes. Indicate a need of the self-work of student and explain how to use basic and supplementary literature for a given course. Motivate to attend regularly the classes and to use consultations.*



#### 4.1.2. List of basic sciences blocks

##### 4.1.2.1. Mathematics block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type
1	ELR051330W	Numerical and Optimization Methods	1					K2ETK_W2	15	60	2	1,4	T	Z			PD	OB
2	ELR051330L	Numerical and Optimization Methods			1			K2ETK_U2 K2ETK_K6	15	30	1	0,7	T	Z		P	PD	OB
Total			1	0	1	0	0		30	90	3	2,1						

##### 4.1.2.2. Physics block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type
1	ELR053312W	Measurement methods and techniques	2					K2ETK_W5 K2ETK_K7	30	60	2	1,4	T	Z			PD	OB
2	ELR053312L	Measurement methods and techniques			2			K2ETK_U4 K2ETK_K7	30	60	2	1,4	T	Z		P	PD	OB
Total			2	0	2	0	0		60	120	4	2,8						

##### 4.1.2.3. Chemistry block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type

#### Altogether for basic sciences blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points
lec	cl	lab	pr	sem				
3	0	3	0	0	90	210	7	4,9

### 4.1.3. List of main-field-of-study blocks

#### 4.1.3.1. Obligatory main-field-of-study block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type
1	ELR051332W	Circuits and Systems	2					K2ETK_W1	30	90	3	2,1	T	E			K	OB
2	ELR051332C	Circuits and Systems		1				K2ETK_U1 K2ETK_K1	15	30	1	0,7	T	Z		P	K	OB
3	ELR052131W	Power System Faults	2					K2ETK_W3 K2ETK_K1	30	120	4	2,8	T	E			K	OB
4	ELR053225W	Dynamics and Control of AC and DC Drives	2					K2ETK_W4	30	120	4	2,8	T	E			K	OB
5	ELR053225L	Dynamics and Control of AC and DC Drives			1			K2ETK_U3 K2ETK_K2 K2ETK_K6	15	30	1	0,7	T	Z		P	K	OB
6	ELR053225P	Dynamics and Control of AC and DC Drives				1		K2ETK_U3 K2ETK_K2 K2ETK_K6	15	30	1	0,7	T	Z		P	K	OB
Total			6	1	1	1	0		135	420	14	9,8						

#### 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	Number of ECTS points
lec	cl	lab	pr	sem	hours	hours	points	points
6	1	1	1	0	135	420	14	9,8

### 4.1.4. List of specialization blocks

#### 4.1.4.1. Obligatory specialization subjects block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type
1	ELR051120W	Advanced High Voltage Technology	2					S2CPE_W7 K2ETK_K7	30	90	3	2,1	T	Z			S	OB
2	ELR051120L	Advanced High Voltage Technology			2			S2CPE_U8 K2ETK_K7	30	60	2	1,4	T	Z		P	S	OB
3	ELR051331W	Power Quality Assessment	2					S2CPE_W13 K2ETK_K1 K2ETK_K2	30	90	3	2,1	T	Z			S	OB
4	ELR051331L	Power Quality Assessment			1			S2CPE_U11 K2ETK_K1 K2ETK_K2	15	30	1	0,7	T	Z		P	S	OB
5	ELR052132W	Digital Control Techniques	2					S2CPE_W12 K2ETK_K2 K2ETK_K6 K2ETK_K7	30	60	2	1,4	T	Z			S	OB
6	ELR052132L	Digital Control Techniques			1			S2CPE_U1 K2ETK_K2 K2ETK_K6 K2ETK_K7	15	30	1	0,7	T	Z		P	S	OB
7	ELR052133W	Simulation and Analysis of Power System Transients	1					S2CPE_W1	15	30	1	0,7	T	Z			S	OB
8	ELR052133L	Simulation and Analysis of Power System Transients			2			S2CPE_U2 K2ETK_K6 K2ETK_K7	30	60	2	1,4	T	Z		P	S	OB
9	ELR052134W	Digital Signal Processing for Protection and Control	2					S2CPE_W2	30	60	2	1,4	T	E			S	OB
10	ELR052134P	Digital Signal Processing for Protection and Control				2		S2CPE_U3 K2ETK_K2	30	60	2	1,4	T	Z		P	S	OB
11	ELR052135W	Artificial Intelligence Techniques	2					S2CPE_W8	30	60	2	1,4	T	Z			S	OB
12	ELR052135P	Artificial Intelligence Techniques				1		S2CPE_U9 K2ETK_K2 K2ETK_K6	15	30	1	0,7	T	Z		P	S	OB
13	ELR052139P	Fault Calculations				2		S2CPE_U12 K2ETK_K2	30	60	2	1,4	T	Z		P	S	OB
14	ELR052140W	Fiber Optics Communications and Sensors	2					S2CPE_W4 K2ETK_K6	30	60	2	1,4	T	Z			S	OB
15	ELR052140L	Fiber Optics Communications and Sensors			2			S2CPE_U5 K2ETK_K6	30	30	1	0,7	T	Z		P	S	OB

16	ELR052231W	Power System Protection	2					S2CPE_W3 K2ETK_K6	30	90	3	2,1	T	E			S	OB
17	ELR052231L	Power System Protection			2			S2CPE_U4 K2ETK_K6	30	60	2	1,4	T	Z		P	S	OB
18	ELR052233W	Power System Automation and Security	2					S2CPE_W9 K2ETK_K6	30	90	3	2,1	T	E			S	OB
19	ELR052233S	Power System Automation and Security					1	S2CPE_U4 K2ETK_K6	15	30	1	0,7	T	Z		P	S	OB
20	ELR052331W	Renewable Energy Sources	2					S2CPE_W5 K2ETK_K6	30	60	2	1,4	T	E			S	OB
21	ELR052331S	Renewable Energy Sources					1	S2CPE_U6 K2ETK_K6	15	30	1	0,7	T	Z		P	S	OB
22	ELR052531W	Electric Power System Operation and Control	2					S2CPE_W6	30	60	2	1,4	T	Z			S	OB
23	ELR052531S	Electric Power System Operation and Control					1	S2CPE_U7 K2ETK_K7	15	30	1	0,7	T	Z		P	S	OB
24	ELR052532W	Electrical Power Systems Management	1					S2CPE_W10 K2ETK_K7	15	30	1	0,7	T	Z			S	OB
25	ELR052532S	Electrical Power Systems Management					1	S2CPE_U7 K2ETK_K7	15	30	1	0,7	T	Z		P	S	OB
26	ELR053311W	Electromagnetic Compatibility	2					S2CPE_W11 K2ETK_K7	30	60	2	1,4	T	Z			S	OB
27	ELR053311L	Electromagnetic Compatibility			1			S2CPE_U10 K2ETK_K7	15	30	1	0,7	T	Z		P	S	OB
28	ESN001501W	Advanced Technology in Electrical Power Generation	2					S2CPE_W14	30	90	3	2,1	T	Z			S	OB
29	ESN001501C	Advanced Technology in Electrical Power Generation		1				S2CPE_U13 K2ETK_K3	15	30	1	0,7	T	Z		P	S	OB
Total			26	1	11	5	4		705	1530	51	35,7						

#### Altogether for specialization blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points
lec	cl	lab	pr	sem				
26	1	11	5	4	705	1530	51	35,7

## 4.2. List of optional blocks

### 4.2.1. List of general education blocks

#### 4.2.1.1. Liberal-managerial subjects block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			university-wide	practical	kind	type
1	FLH051721S	Ethics in bussiness					1	K2ETK_U7 K2ETK_K6	15	50	2	1,4	T	Z	O	P	KO	W
2	PKH053721S	The art of public speaking					1	K2ETK_U7 K2ETK_K6	15	50	2	1,4	T	Z	O	P	KO	W
3	PKH053821S	Social communication					1	K2ETK_U7 K2ETK_K6	15	50	2	1,4	T	Z	O	P	KO	W
4	PRR051231W	Intellectual property rights in the world	1					K2ETK_W7 K2ETK_K3 K2ETK_K5	15	25	1	0,7	T	Z	O		KO	W
5	PRR051232W	Inventions and patents	1					K2ETK_W7 K2ETK_K3 K2ETK_K5	15	25	1	0,7	T	Z	O		KO	W
6	PRR051233W	Industrial property and copyright for engineers	1					K2ETK_W7 K2ETK_K3 K2ETK_K5	15	25	1	0,7	T	Z	O		KO	W
7	PRZ001007W	Protection of Intellectual Property	1					K2ETK_W7 K2ETK_K3 K2ETK_K5	15	25	1	0,7	T	Z	O		KO	W
8	PRZ001008W	International Law	1					K2ETK_W7 K2ETK_K3 K2ETK_K5	15	25	1	0,7	T	Z	O		KO	W
9	ZMR052538W	Market Mechanisms in Power Systems with Distributed Energy	1					K2ETK_W6 K2ETK_K3 K2ETK_K6	15	50	2	1,4	T	Z	O		KO	W
10	ZMZ001499W	Fundamentals of Management	1					K2ETK_W6 K2ETK_K3 K2ETK_K6	15	50	2	1,4	T	Z	O		KO	W
Total			2	0	0	0	1		45	125	5	3,5						

#### 4.2.1.2. Foreign languages block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of creditin g	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type
1	JZL100709BKC	Foreign language B2+ or C1+		1				K2ETK_U5 K2ETK_K1	15	30	1	0,7	T	Z	O	P	KO	W
2	JZL100710BKC	Foreign language A1 or A2		3				K2ETK_U6 K2ETK_K1	45	60	2	1,4	T	Z	O	P	KO	W
Total			0	4	0	0	0		60	90	3	2,1						

#### 4.2.1.3. Sporting classes block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of creditin g	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type

#### 4.2.1.4. Information technologies block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of creditin g	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type

#### Altogether for general education blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points
lec	cl	lab	pr	sem				
2	4	0	0	1	105	215	8	5,6



## 4.2.4. List of specialization blocks

### 4.2.4.1. Specialization subjects block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of crediting	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type
1	ELR051230W	Visual Engineering Environments and Graphical Languages	1					S2CPE_W15	15	30	1	0,7	T	E			S	W
2	ELR051230L	Visual Engineering Environments and Graphical Languages			2			S2CPE_U14 K2ETK_K2	30	90	3	2,1	T	Z		P	S	W
3	ELR051334W	Signal and Systems	2					S2CPE_W15	30	90	3	2,1	T	E			S	W
4	ELR051334C	Signal and Systems		1				S2CPE_U14 K2ETK_K1	15	30	1	0,7	T	Z		P	S	W
5	ELR051335W	Advanced Signal Processing Methods	2					S2CPE_W15	30	90	3	2,1	T	E			S	W
6	ELR051335C	Advanced Signal Processing Methods		1				S2CPE_U14 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
7	ELR052136W	Design of logic circuits	1					S2CPE_W16	15	60	2	1,4	T	Z			S	W
8	ELR052136L	Design of logic circuits			1			S2CPE_U15 K2ETK_K1 K2ETK_K2 K2ETK_K7	15	30	1	0,7	T	Z		P	S	W
9	ELR052138W	Electrical Power Engineering – excursionary activities	1					S2CPE_W16 K2ETK_K6	15	60	2	1,4	T	Z			S	W
10	ELR052138S	Electrical Power Engineering – excursionary activities					1	S2CPE_U15 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
11	ELR052234W	PLC and Wireless Communications for Monitoring and Metering	2					S2CPE_W15 K2ETK_K6	30	90	3	2,1	T	E			S	W
12	ELR052234S	PLC and Wireless Communications for Monitoring and Metering					1	S2CPE_U14 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
13	ELR052335W	Advanced Substations and Electrical Equipment	2					S2CPE_W15	30	90	3	2,1	T	E			S	W
14	ELR052335P	Advanced Substations and Electrical Equipment				1		S2CPE_U14 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
15	ELR052534W	Power System Modelling	2					S2CPE_W15	30	90	3	2,1	T	E			S	W
16	ELR052534P	Power System Modelling				1		S2CPE_U14 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
17	ELR052535W	Computer Control of Power System	2					S2CPE_W15	30	90	3	2,1	T	E			S	W
18	ELR052535S	Computer Control of Power System					1	S2CPE_U14 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
19	ELR053226W	Fuzzy Logic Control	1					S2CPE_W16	15	60	2	1,4	T	Z			S	W
20	ELR053226L	Fuzzy Logic Control			1			S2CPE_U15 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
21	ELR053227W	Control of Power Electronic Converters	1					S2CPE_W16 K2ETK_K6	15	60	2	1,4	T	Z			S	W
22	ELR053227L	Control of Power Electronic Converters			1			S2CPE_U15 K2ETK_K6	15	30	1	0,7	T	Z		P	S	W
Total			3	1	1	0	0		75	210	7	4,9						

#### 4.2.4.2. Training block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of creditin g	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type
1	ELR055105Q	Diploma placement 4 weeks				40		S2CPE_U16 K2ETK_K6	160	120	4	2,8	T	Z		P	S	W
Total			0	0	0	40	0		160	120	4	2,8						

#### 4.2.4.3. Diploma dissertation block

No.	Course code	Name of course	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points		Form of course	Way of creditin g	Course			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes			universit y-wide	practical	kind	type
1	ELR055108S	Diploma seminar					2	S2CPE_U18 K2ETK_K6	30	90	3	2,1	T	Z		P	S	W
2	ELR055117P ELR055127P ELR055137P	Diploma Project				8		S2CPE_U17 K2ETK_K6	120	240	8	5,6	T	Z		P	S	W
3	ELR055119D ELR055129D ELR055139D	Master's thesis				12		S2CPE_U19 K2ETK_K4 K2ETK_K6	180	540	18	12,6	T	Z		P	S	W
Total			0	0	0	20	2		330	870	29	20,3						

#### Altogether for specialization blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points
lec	cl	lab	pr	sem				
3	1	1	60	2	565	1200	40	28

### 4.3 Training module (Faculty Council resolution on principles of crediting training – attachment no.2 to description of the program of studies )

Name of training:	Diploma placement 4 weeks		
Number of ECTS points	Number of ECTS points for BK classes	Training crediting mode	Code
4	2,8	report from training	ELR055105Q
Training duration	Training objective		
4 weeks	<p>"The primary objective is to confront the theoretical knowledge acquired in the course included in the learning schedule, with the real demands of the employers. During practice the student gains industrial experience, take note of the basic technical equipment and technology of the companies, learns the specificity of work of the higher technical inspection facility, in particular:</p> <ul style="list-style-type: none"> <li>• extends the knowledge gained during studies and develops the skills to use it,</li> <li>• familiarize themselves with the specific of professional environment,</li> <li>• shapes specific professional skills directly related to the place of practice,</li> <li>• shapes the skills of effective communication in an organization,</li> <li>• learns the functioning in an organizational structure, the principles of the organization of work and the division of powers, procedures, work planning, control,</li> <li>• improves the ability of self organization, teamwork, effective time management, diligence, responsibility for assigned tasks,</li> <li>• improves the ability to use a foreign language in professional contexts.</li> </ul> <p>By free choice of the place of practice, ie by their own choice of the ""Company"" or the choice of units and facilities from the faculty list, students can pursue their professional interests. There is a possibility of some connection with the subject of the future practice of Master thesis. The practice allows you to focus the student's preferences with regard to the future work."</p>		

### 4.4. Diploma dissertation module

Type of diploma dissertation:	magister	
Number of diploma dissertation semesters	Number of ECTS points	Code
1	29	ELR055108S ELR055117P ELR055127P ELR055137P ELR055119D
Character of diploma dissertation		
<p>Master's thesis has a computational, theoretical character, or may contain a description and analysis of the performed experimental studies. In each case it contains a section in which the author alone interpret and draw conclusions from their research. Intellectual contributions of private study should be clearly visible.</p>		
Number of BK ECTS points:	20,3	

### 5. Ways of verifying assumed learning outcomes

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

### 6. Range of diploma dissertation

The diploma examination problems are available on the Faculty website.

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

No.	Course code	Name of course	Crediting by deadline of... (number of semester)
1			
2			
3			
4			

### 8. Plan of studies (attachment no. 1 to description of the program of studies)

Approved by faculty student government legislative body:

.....  
Date

.....  
Name and surname, signature of student representative

.....  
Date

.....  
Dean's signature