

PROGRAMME OF STUDIES

1. Description

<p><i>Number of semesters: 4</i></p>	<p><i>Number ECTS points necessary to obtain qualifications: 120</i></p>
<p><i>Prerequisites:</i></p> <ul style="list-style-type: none"> • <i>completed undergraduate degree in Electrical Engineering at universities in Poland or abroad,</i> • <i>completed undergraduate degree in related field of study, verified by the Qualification Commission,</i> • <i>knowledge of the English language at a level equivalent to B2 certificate.</i> 	<p><i>Upon completion of studies graduate obtains professional degree of: master of science, engineer</i></p> <p><i>2nd level qualifications</i></p>
<p><i>Possibility of continuing studies: 3rd level studies (PhD)</i></p>	<p><i>Graduate profile, employability:</i></p> <p><i>A graduate of English-language specialty of the second cycle of Renewable Energy Sources (Renewable Energy Systems) has an advanced and well-established knowledge of these sources of energy, including power generation, automation and control, market mechanisms and investment processes in the energy of a dispersed structure. He has the ability to apply computer tools to analyze phenomena in electrical power systems with renewable energy sources. He is capable of creative work and to make decisions and lead teams labour. He is prepared to continue his education in studies of third degree (PhD) in domestic and foreign universities.</i></p>
<p><i>Indicate connection with University's mission and its development strategy:</i></p> <p><i>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.</i></p>	

2. Fields of science and scientific disciplines to which educational effects apply:

science field: technical sciences, science discipline: Electrical Engineering

3. Concise analysis of consistency between assumed educational effects and labour market needs:

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.

4.1.2. List of basic sciences modules

4.1.2.1. Mathematics module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR041330W	Numerical and Optimization Methods	1					K2ETK_W02	15	60	2	1,4	T	Z			PD	OB
2	ELR041330L	Numerical and Optimization Methods			1			K2ETK_U02 K2ETK_K06	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 module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR043312W	Measurement methods and techniques	2					K2ETK_W05 K2ETK_K07	30	60	2	1,4	T	Z			PD	OB
2	ELR043312L	Measurement methods and techniques			2			K2ETK_U04 K2ETK_K07	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 module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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

Altogether for basic sciences modules

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 modules

4.1.3.1. Obligatory main-field-of-study module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR041332W	Circuits and Systems	2					K2ETK_W01	30	90	3	2,1	T	E			K	OB
2	ELR041332C	Circuits and Systems		1				K2ETK_U01 K2ETK_K01	15	30	1	0,7	T	Z		P	K	OB
3	ELR042131W	Power Systems Faults	2					K2ETK_W03 K2ETK_K01	30	120	4	2,8	T	E			K	OB
4	ELR043225W	Dynamics and Control of AC and DC Drives	2					K2ETK_W04	30	120	4	2,8	T	E			K	OB
5	ELR043225L	Dynamics and Control of AC and DC Drives			1			K2ETK_U03 K2ETK_K02 K2ETK_K06	15	30	1	0,7	T	Z		P	K	OB
6	ELR043225P	Dynamics and Control of AC and DC Drives				1		K2ETK_U03 K2ETK_K02 K2ETK_K06	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 modules

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				
6	1	1	1	0	135	420	14	9,8

4.1.4. List of specialization modules

4.1.4.1. Obligatory specialization subjects module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR041331W	Power Quality Assessment	2					S2RES_W13 K2ETK_K01 K2ETK_K02	30	90	3	2,1	T	Z			S	OB
2	ELR041331L	Power Quality Assessment			1			S2RES_U13 K2ETK_K01 K2ETK_K02	15	30	1	0,7	T	Z		P	S	OB
3	ELR041337W	Photovoltaic Cells	2					S2RES_W08 K2ETK_K06	30	60	2	1,4	T	E			S	OB
4	ELR041337L	Photovoltaic Cells			1			S2RES_U08 K2ETK_K06	15	30	1	0,7	T	Z		P	S	OB
5	ELR041338W	Industrial ecology - selected problems	1					S2RES_W09 K2ETK_K03	15	30	1	0,7	T	Z			S	OB
6	ELR041338S	Industrial ecology - selected problems					1	S2RES_U09 K2ETK_K03	15	30	1	0,7	T	Z		P	S	OB
7	ELR042133W	Simulation and Analysis of Power System Transients	1					S2RES_W15	15	30	1	0,7	T	Z			S	OB
8	ELR042133L	Simulation and Analysis of Power System Transients			2			S2RES_U16 K2ETK_K06 K2ETK_K07	30	60	2	1,4	T	Z		P	S	OB
9	ELR042135W	Artificial Intelligence Techniques	2					S2RES_W16	30	60	2	1,4	T	Z			S	OB
10	ELR042135P	Artificial Intelligence Techniques				1		S2RES_U18 K2ETK_K02	15	30	1	0,7	T	Z		P	S	OB
11	ELR042137W	Protection and Control of Distributed Energy Sources	1					S2RES_W02	15	60	2	1,4	T	E			S	OB
12	ELR042137L	Protection and Control of Distributed Energy Sources			1			S2RES_U02 K2ETK_K01 K2ETK_K06	15	30	1	0,7	T	Z		P	S	OB
13	ELR042137S	Protection and Control of Distributed Energy Sources					1	S2RES_U07	15	30	1	0,7	T	Z		P	S	OB
14	ELR042139P	Fault Calculations				2		S2RES_U14 K2ETK_K02	30	60	2	1,4	T	Z		P	S	OB
15	ELR042331W	Renewable Energy Sources	2					S2RES_W05 K2ETK_K06	30	60	2	1,4	T	Z			S	OB
16	ELR042331S	Renewable Energy Sources					1	S2RES_U05 K2ETK_K06	15	30	1	0,7	T	Z		P	S	OB

17	ELR042332W	Water Power Plants	2					S2RES_W04	30	60	2	1,4	T	Z			S	OB
18	ELR042332S	Water Power Plants					1	S2RES_U04 K2ETK_K07	15	30	1	0,7	T	Z		P	S	OB
19	ELR042334W	Energy Storage Systems	1					S2RES_W03	15	60	2	1,4	T	E			S	OB
20	ELR042334P	Energy Storage Systems					1	S2RES_U03 K2ETK_K07	15	30	1	0,7	T	Z		P	S	OB
21	ELR042536W	Integration of Distributed Resources in Power Systems	2					S2RES_W06 K2ETK_K06	30	60	2	1,4	T	E			S	OB
22	ELR042536L	Integration of Distributed Resources in Power Systems					1	S2RES_U06 K2ETK_K06	15	30	1	0,7	T	Z		P	S	OB
23	ELR042537W	Legal Regulations and Investments in Power Systems with Distributed Energy Sources	2					S2RES_W12 K2ETK_K06	30	60	2	1,4	T	Z			S	OB
24	ELR042537S	Legal Regulations and Investments in Power Systems with Distributed Energy Sources					1	S2RES_U12 K2ETK_K06	15	30	1	0,7	T	Z		P	S	OB
25	ELR043110W	Modelling of Electrical Machines	1					S2RES_W10	15	30	1	0,7	T	Z			S	OB
26	ELR043110P	Modelling of Electrical Machines					2	S2RES_U10 K2ETK_K06	30	60	2	1,4	T	Z		P	S	OB
27	ELR043228W	Power Electronics	2					S2RES_W01 K2ETK_K07	30	60	2	1,4	T	Z			S	OB
28	ELR043228L	Power Electronics					1	S2RES_U01 K2ETK_K07	15	30	1	0,7	T	Z		P	S	OB
29	ELR043229W	Electromechanical Systems in Renewable Energy	1					S2RES_W07	15	30	1	0,7	T	Z			S	OB
30	ELR043229S	Electromechanical Systems in Renewable Energy					1	S2RES_U17 K2ETK_K01	15	30	1	0,7	T	Z		P	S	OB
31	ELR043311W	Electromagnetic Compatibility	2					S2RES_W11 K2ETK_K07	30	60	2	1,4	T	Z			S	OB
32	ELR043311L	Electromagnetic Compatibility					1	S2RES_U11 K2ETK_K07	15	30	1	0,7	T	Z		P	S	OB
33	ESN001501W	Advanced Technology in Electrical Power Generation	2					S2RES_W14	30	90	3	2,1	T	Z			S	OB
34	ESN001501C	Advanced Technology in Electrical Power Generation					1	S2RES_U15 K2ETK_K03	15	30	1	0,7	T	Z		P	S	OB
Total			26	1	8	6	6		705	1530	51	35,7						

Altogether for specialization modules

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	8	6	6	705	1530	51	35,7

4.2. List of optional modules

4.2.1. List of general education modules

4.2.1.1. Liberal-managerial subjects module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	FLH051721S	Ethics in bussiness					1	K2ETK_U07 K2ETK_K06	15	60	2	1,4	T	Z	O	P	KO	W
2	PKH053721S	The art of public speaking					1	K2ETK_U07 K2ETK_K06	15	60	2	1,4	T	Z	O	P	KO	W
3	PKH053821S	Social communication					1	K2ETK_U07 K2ETK_K06	15	60	2	1,4	T	Z	O	P	KO	W
4	PRR041231W	Intellectual property rights in the world	1					K2ETK_W07 K2ETK_K03 K2ETK_K05	15	30	1	0,7	T	Z	O		KO	W
5	PRR041232W	Inventions and patents	1					K2ETK_W07 K2ETK_K03 K2ETK_K05	15	30	1	0,7	T	Z	O		KO	W
6	PRR041233W	Industrial property and copyright for engineers	1					K2ETK_W07 K2ETK_K03 K2ETK_K05	15	30	1	0,7	T	Z	O		KO	W
7	PRZ001007W	Protection of Intellectual Property	1					K2ETK_W07 K2ETK_K03 K2ETK_K05	15	30	1	0,7	T	Z	O		KO	W
8	PRZ001008W	International Law	1					K2ETK_W07 K2ETK_K03 K2ETK_K05	15	30	1	0,7	T	Z	O		KO	W
9	ZMR042538W	Market Mechanisms in Power Systems with Distributed Energy	1					K2ETK_W06 K2ETK_K03 K2ETK_K06	15	60	2	1,4	T	Z	O		KO	W
10	ZMZ001499W	Fundamentals of Management	1					K2ETK_W06 K2ETK_K03 K2ETK_K06	15	60	2	1,4	T	Z	O		KO	W
Total			2	0	0	0	1		45	150	5	3,5						

4.2.1.2. Foreign languages module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	JZL100709BKC	Foreign language B2+ or C1+		1				K2ETK_U05 K2ETK_K01	15	30	1	0,7	T	Z	O	P	KO	W
2	JZL100710BKC	Foreign language A1 or A2		3				K2ETK_U06 K2ETK_K01	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 module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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

4.2.3. List of main-field-of-study modules

4.2.3.1. Optional main-field-of-study subjects module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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

4.2.3.2. Training module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR045105Q	Diploma placement 4 weeks				40		S2RES_U21 K2ETK_K06	160	120	4	2,8	T	Z		P	S	W
Total						40			160	120	4	2,8						

4.2.3.3. Diploma dissertation module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR045108S	Diploma seminar					2	S2RES_U23 K2ETK_K06	30	90	3	2,1	T	Z		P	S	W
2	ELR045117P ELR045127P ELR045137P	Diploma Project				8		S2RES_U22 K2ETK_K06	120	240	8	5,6	T	Z		P	S	W
3	ELR045119D ELR045129D ELR045139D	Master's thesis				12		S2RES_U24 K2ETK_K04 K2ETK_K06	180	540	18	12,6	T	Z		P	S	W
Total			0	0	0	20	2		330	870	29	20,3						

Altogether for main-field-of-study modules

	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				
Diploma placement 4 weeks				40		160	120	4	2,8
	0	0	0	20	2	330	870	29	20,3

4.2.4. List of specialization modules

4.2.4.1. Specialization subjects module

No.	Course code	Name of course	Weekly number of hours					Field-of-study educational 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	ELR041230W	Visual Engineering Environments and Graphical Languages	1					S2RES_W17	15	30	1	0,7	T	E			S	W
2	ELR041230L	Visual Engineering Environments and Graphical Languages			2			S2RES_U19 K2ETK_K02	30	90	3	2,1	T	Z		P	S	W
3	ELR041334W	Signal and Systems	2					S2RES_W17	30	90	3	2,1	T	E			S	W
4	ELR041334C	Signal and Systems		1				S2RES_U19 K2ETK_K01	15	30	1	0,7	T	Z		P	S	W
5	ELR041335W	Advanced Signal Processing Methods	2					S2RES_W17	30	90	3	2,1	T	E			S	W
6	ELR041335C	Advanced Signal Processing Methods		1				S2RES_U19 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
7	ELR042136W	Design of logic circuits	1					S2RES_W18	15	60	2	1,4	T	Z			S	W
8	ELR042136L	Design of logic circuits			1			S2RES_U20 K2ETK_K01 K2ETK_K02 K2ETK_K07	15	30	1	0,7	T	Z		P	S	W
9	ELR042138W	Electrical Power Engineering – excursionary activities	1						15	60	2	1,4	T	Z			S	W
10	ELR042138S	Electrical Power Engineering – excursionary activities					1		15	30	1	0,7	T	Z		P	S	W
11	ELR042234W	PLC and Wireless Communications for Monitoring and Metering	2					S2RES_W17 K2ETK_K06	30	90	3	2,1	T	E			S	W
12	ELR042234S	PLC and Wireless Communications for Monitoring and Metering					1	S2RES_U19 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
13	ELR042335W	Advanced Substations and Electrical Equipment	2					S2RES_W17	30	90	3	2,1	T	E			S	W
14	ELR042335P	Advanced Substations and Electrical Equipment				1		S2RES_U19 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
15	ELR042534W	Power System Modelling	2					S2RES_W17	30	90	3	2,1	T	E			S	W
16	ELR042534P	Power System Modelling				1		S2RES_U19 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
17	ELR042535W	Computer Control of Power System	2					S2RES_W17	30	90	3	2,1	T	E			S	W
18	ELR042535S	Computer Control of Power System					1	S2RES_U19 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
19	ELR043226W	Fuzzy Logic Control	1					S2RES_W18	15	60	2	1,4	T	Z			S	W
20	ELR043226L	Fuzzy Logic Control			1			S2RES_U20 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
21	ELR043227W	Control of Power Electronic Converters	1					S2RES_W18 K2ETK_K06	15	60	2	1,4	T	Z			S	W
22	ELR043227L	Control of Power Electronic Converters			1			S2RES_U20 K2ETK_K06	15	30	1	0,7	T	Z		P	S	W
Total			3	0	1	1	0		75	210	7	4,9						

Altogether for specialization modules

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	1	1	0	75	210	7	4,9

4.3 Training module (Faculty Council resolution on principles of crediting training – attachment no.2)

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	ELR045105Q
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"> • extends the knowledge gained during studies and develops the skills to use it, • familiarize themselves with the specific of professional environment, • shapes specific professional skills directly related to the place of practice, • shapes the skills of effective communication in an organization, • learns the functioning in an organizational structure, the principles of the organization of work and the division of powers, procedures, work planning, control, • improves the ability of self organization, teamwork, effective time management, diligence, responsibility for assigned tasks, • improves the ability to use a foreign language in professional contexts. <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	ELR045108S ELR045117P ELR045127P ELR045137P ELR045119D
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 educational effects

Type of classes	Ways of verifying assumed educational effects
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. Total number of ECTS points, which student has to obtain from classes requiring direct academic teacher-student contact (enter total of ECTS points for courses/groups of courses denoted with code BK)

84 ECTS

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

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

Number of ECTS points for obligatory subjects	27
Number of ECTS points for optional subjects	40
Total number of ECTS points	67

9. Minimum number of ECTS points, which student has to obtain doing education modules offered as part of university-wide classes or other main field of study

8 ECTS

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

48 ECTS

11. Range of diploma dissertation

The diploma examination problems are available on the Faculty website.

12. Requirements concerning deadlines for crediting courses/groups of courses for all courses in particular modules

No.	Course code	Name of course	Crediting by deadline of... (number of semester)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

13. Plan of studies (attachment no.1)

Approved by faculty student government legislative body:

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Date

.....

Name and surname, signature of student representative

.....

Date

.....

Dean's signature