

## PROGRAMME OF STUDIES

### 1. Description

<i>Number of semesters: 3</i>	<i>Number ECTS points necessary to obtain qualifications: 90</i>
<i>Prerequisites:</i> <ul style="list-style-type: none"> <li>• <i>completed undergraduate degree in Control Engineering and Robotics at universities in Poland or abroad,</i></li> <li>• <i>completed undergraduate degree in related field of study, verified by the Qualification Commission.</i></li> </ul>	<i>Upon completion of studies graduate obtains professional degree of: master of science, engineer 2nd level qualifications</i>
<i>Possibility of continuing studies: 3rd level studies (PhD)</i>	<i>Graduate profile, employability:</i> <i>A graduate of the second level studies has an advanced knowledge and practical skills needed for creative action in the analysis, design and construction of automation circuits and systems, control and programming of industrial automation systems, and the design of decision support systems.</i> <i>A graduate of the second level studies in specialization "Automation and Control in Electrical Power Engineering", is especially educated to design and operate control systems in electrical power systems, utilizing modern digital techniques and intelligent systems.</i> <i>A graduate of the second level studies is prepared to lead workers teams in industrial units and is well prepared for the design and research work. He has acquired habits of lifelong learning and constant professional development. He can continue education qualifying for third level studies.</i>
<i>Indicate connection with University's mission and its development strategy:</i> <i>The knowledge gained during studies will not only lead to success in future professional career of the graduate, but also shapes the human being with a sense of entrepreneurship, creativeness and openness to new challenges.</i>	

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

*sicence field: technical sciences, science discipline: Control Engineering and Robotics*

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

*Current needs of the labor market are related to the industry, which is characterized by a high degree of automation and robotics. Graduates of second level studies in Control Engineering and Robotics are trained to design and retrofit automatic control systems used in various industrial processes, with particular emphasis on automation machinery, vehicles, apparatus, and power systems. Due to acquired knowledge and practical skills in the field of industrial automation and power system automation, graduates are prepared to work in R & D centers and at decisive positions, are skilled to fulfill management duties in industry and design centers.*

#### 4. List of education modules:

#### 4.1. List of obligatory modules

#### 4.1.1. List of general education modules

#### 4.1.1.1. 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

#### 4.1.1.2. 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

#### 4.1.1.3. 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

#### 4.1.1.4. Information technologies 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 general education modules

[illegible]

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	ARR041309W	Mathematical optimisation	2					K2AiR_W01	30	90	3	2,1	T	E			PD	OB
2	ARR041309L	Mathematical optimisation			1			K2AiR_U01 K2AiR_K06	15	60	2	1,4	T	Z		P	PD	OB
Total			2	0	1	0	0		45	150	5	3,5						

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	ARR042511W	Control object identification	2					K2AiR_W04 K2AiR_K02	30	60	2	1,4	T	Z			PD	OB
2	ARR042511L	Control object identification			1			K2AiR_U03 K2AiR_K02	15	30	1	0,7	T	Z		P	PD	OB
Total			2	0	1	0	0		45	90	3	2,1						

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				
4	0	2	0	0	90	240	8	5,6

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			universit y-wide	practical	kind	type
1	ARR042111W	Fundamentals of system modelling	1					K2AiR_W02	15	30	1	0,7	T	Z			K	OB
2	ARR042111L	Fundamentals of system modelling			1			K2AiR_U02 K2AiR_K01 K2AiR_K02	15	30	1	0,7	T	Z		P	K	OB
3	ARR042112W	Control theory	2					K2AiR_W02 K2AiR_W01 K2AiR_W03 K2AiR_K01 K2AiR_K02 K2AiR_K03 K2AiR_K04	30	90	3	2,1	T	E			K	OB
Total			3	0	1	0	0		60	150	5	3,5						

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				
3	0	1	0	0	60	150	5	3,5

#### 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	ARR042113W	Digital techniques in power system control and protection	1					S2ASE_W04 K2AIR_W04 K2AIR_W02 S2ASE_W06	15	30	1	0,7	T	Z			S	OB
2	ARR042113P	Digital techniques in power system control and protection				1		K2AIR_U02 S2ASE_U03 S2ASE_U06 K2AIR_U03 K2AIR_K06 K2AIR_K07	15	30	1	0,7	T	Z		P	S	OB
3	ARR042115W	Artificial intelligence in power system protection and control	2					S2ASE_W07	30	120	4	2,8	T	E			S	OB
4	ARR042115P	Artificial intelligence in power system protection and control				1		S2ASE_U05 K2AIR_K06 K2AIR_K07	15	30	1	0,7	T	Z		P	S	OB
5	ARR042116W	Fundamentals of digital power system protection and control	2					S2ASE_W08	30	120	4	2,8	T	E			S	OB
6	ARR042116L	Fundamentals of digital power system protection and control			2			S2ASE_U06 K2AIR_K02 K2AIR_K07	30	60	2	1,4	T	Z		P	S	OB
7	ARR042117L	Microprocessor controllers in electrical power engineering			2			S2ASE_U10 K2AIR_K06 K2AIR_K07	30	60	2	1,4	T	Z		P	S	OB
8	ARR042118W	Electromagnetic transients simulation	1					K2AIR_W02 K2AIR_W03 S2ASE_W06	15	30	1	0,7	T	Z			S	OB
9	ARR042118P	Electromagnetic transients simulation				1		K2AIR_U02 K2AIR_U03 S2ASE_U04 K2AIR_K02	15	30	1	0,7	T	Z		P	S	OB
10	ARR042211W	Electric power system control and operation	2					S2ASE_W01	30	60	2	1,4	T	Z			S	OB
11	ARR042211L	Electric power system control and operation			1			S2ASE_U01 K2AIR_K02	15	30	1	0,7	T	Z		P	S	OB
12	ARR042214W	Fiber Optics	2					S2ASE_W02 K2AIR_K06	30	30	1	0,7	T	Z			S	OB
13	ARR042311W	Devices and control standards of electrical installations	2					S2ASE_W09 K2AIR_K06	30	120	4	2,8	T	E			S	OB
14	ARR042311C	Devices and control standards of electrical installations		2				S2ASE_U07 K2AIR_K06	30	60	2	1,4	T	Z		P	S	OB
15	ARR042312W	Intelligent building automation	1					S2ASE_W11	15	30	1	0,7	T	Z			S	OB
16	ARR042312L	Intelligent building automation			1			S2ASE_U09 K2AIR_K07	15	30	1	0,7	T	Z		P	S	OB
17	ARR042312P	Intelligent building automation				2		S2ASE_U07 S2ASE_U09	30	60	2	1,4	T	Z		P	S	OB
18	ARR042512W	Automation of electric power systems	2					S2ASE_W01 S2ASE_W03	30	120	4	2,8	T	E			S	OB
19	ARR042512L	Automation of electric power systems			1			S2ASE_U02 K2AIR_K06	15	30	1	0,7	T	Z		P	S	OB
20	ARR042513W	Computer Control of Power System	2					S2ASE_W05	30	60	2	1,4	T	Z			S	OB
21	ARR042513S	Computer Control of Power System					1	S2ASE_U01 S2ASE_U08 K2AIR_K06	15	30	1	0,7	T	Z		P	S	OB
22	ARR042514W	Load management	2					S2ASE_W10 K2AIR_K04	30	60	2	1,4	T	Z			S	OB
Total			19	2	7	5	1		510	1230	41	28,7						

##### 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				
19	2	7	5	1	510	1230	41	28,7

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	FLH051621S	Ethics in bussiness					1	K2AIR_U06 K2AIR_K06	15	60	2	1,4	T	Z	O	P	KO	W
2	PKH050421S	Social communication					1	K2AIR_U06 K2AIR_K06	15	60	2	1,4	T	Z	O	P	KO	W
3	PKH050521S	The art of public speaking					1	K2AIR_U06 K2AIR_K06	15	60	2	1,4	T	Z	O	P	KO	W
4	PRR041216W	Standardization and engineering law	1					K2AIR_W06 K2AIR_K03 K2AIR_K05	15	30	1	0,7	T	Z	O		KO	W
5	PRR041217W	Engineering law	1					K2AIR_W06 K2AIR_K03 K2AIR_K05	15	30	1	0,7	T	Z	O		KO	W
6	PRR041218W	Technical Standardization	1					K2AIR_W06 K2AIR_K03 K2AIR_K05	15	30	1	0,7	T	Z	O		KO	W
7	ZMR042513W	Management of a Company	1					K2AIR_W05 K2AIR_K03 K2AIR_K06	15	60	2	1,4	T	Z	O		KO	W
8	ZMR042521W	Management in the power industry	1					K2AIR_W05 K2AIR_K03 K2AIR_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				K2AIR_U04 K2AIR_K01	15	30	1	0,7	T	Z	O	P	KO	W
2	JZL100710BKC	Foreign language A1 or A2		3				K2AIR_U05 K2AIR_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

4.2.1.4. Information technologies 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 general education 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				
2	4	0	0	1	105	240	8	5,6

#### 4.2.2.1. 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

#### 4.2.2.2. 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

#### 4.2.2.3. 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

[illegible]



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

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	ARR041159D ARR042159D ARR043159D	Master's thesis				12		S2ASE_U14 K2AiR_K04 K2AiR_K06	180	540	18	12,6	T	Z		P	S	W
2	ARR042158S	Diploma seminar					2	S2ASE_U13 K2AiR_K06	30	90	3	2,1	T	Z		P	S	W
Total			0	0	0	12	2		210	630	21	14,7						

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				
0	0	0	12	2	210	630	21	14,7

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			universit y-wide	practical	kind	type
1	ARR041101W	Electromagnetic Compatibility	2					S2ASE_W12 K2AiR_K06	30	60	2	1,4	T	E			S	W
2	ARR041101L	Electromagnetic Compatibility			1			S2ASE_U11 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
3	ARR041310W	Teleinformatic networks in the technics	1					S2ASE_W13	15	30	1	0,7	T	Z			S	W
4	ARR041310L	Teleinformatic networks in the technics			1			S2ASE_U12 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
5	ARR042119W	Programmable controllers in automation	1					S2ASE_W13	15	30	1	0,7	T	Z			S	W
6	ARR042119L	Programmable controllers in automation			1			S2ASE_U12 K2AiR_K06 K2AiR_K07	15	30	1	0,7	T	Z		P	S	W
7	ARR042213W	Power System Protection	2					S2ASE_W12	30	60	2	1,4	T	E			S	W
8	ARR042213L	Power System Protection			1			S2ASE_U11 K2AiR_K07	15	30	1	0,7	T	Z		P	S	W
9	ARR042313W	Optimization methods in electric power industry	2					S2ASE_W14 K2AiR_K01	30	60	2	1,4	T	Z			S	W
10	ARR042314W	Static converters in industry	2					S2ASE_W14 K2AiR_K06	30	60	2	1,4	T	Z			S	W
11	ARR042315W	Static convertors - applications	2					S2ASE_W14 K2AiR_K06	30	60	2	1,4	T	Z			S	W
12	ARR042411W	Electrical installations of power objects	2					S2ASE_W12	30	60	2	1,4	T	E			S	W
13	ARR042411C	Electrical installations of power objects		1				S2ASE_U11 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
14	ARR042517W	Electric energy generation	2					S2ASE_W12 K2AiR_K06	30	60	2	1,4	T	E			S	W
15	ARR042517C	Electric energy generation		1				S2ASE_U11 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
16	ARR043226W	Monitoring and diagnostic systems in industry	2					S2ASE_W12	30	60	2	1,4	T	E			S	W
17	ARR043226L	Monitoring and diagnostic systems in industry			1			S2ASE_U11 K2AiR_K06 K2AiR_K07	15	30	1	0,7	T	Z		P	S	W
18	ARR043234W	Neural Networks in Control Engineering	1					S2ASE_W13	15	30	1	0,7	T	Z			S	W
19	ARR043234L	Neural Networks in Control Engineering			1			S2ASE_U12 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
20	ARR043235W	Fuzzy Logic Control	1					S2ASE_W13	15	30	1	0,7	T	Z			S	W
21	ARR043235L	Fuzzy Logic Control			1			S2ASE_U12 K2AiR_K06	15	30	1	0,7	T	Z		P	S	W
Total			5		2				105	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	Numb er of ECTS points
lec	cl	lab	pr	sem				
5	0	2	0	0	105	210	7	4,9

#### 4.3 Training module (Faculty Council resolution on principles of crediting training – attachment ... )

Name of training:			
Number of ECTS points	Number of ECTS points for BK classes	Training crediting mode	Code
Training duration	Training objective		

#### 4.4. Diploma dissertation module

Type of diploma dissertation:	magister	
Number of diploma dissertation semesters	Number of ECTS points	Code
1	21	ARR042158S ARR041159D ARR042159D ARR043159D
Character of diploma dissertation		
Critical elaboration of a detailed problem related to the field of study, problem description, and analysis of a mathematical model, computer simulations and analysis, specification and design of the device and the results of research on it, and peroration of a technical documentation.		
Number of BK ECTS points:	14,7	

#### 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
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)

63 ECTS

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

Number of ECTS points for obligatory subjects	8
Number of ECTS points for optional subjects	0
Total number of ECTS points	8

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

Number of ECTS points for obligatory subjects	19
Number of ECTS points for optional subjects	28
Total number of ECTS points	47

**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)**

36 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:

.....  
Date

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

.....  
Date

.....  
Dean's signature