

# PROGRAMME OF EDUCATION

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: POWER ENGINEERING

in area of TECHNICAL science

EDUCATION LEVEL: 1st level, inżynier

FORM OF STUDIES: part-time

PROFILE: general academic

SPECIALIZATION: THERMAL POWER ENGINEERING

LANGUAGE OF STUDY: POLISH

Content:

1. Assumed educational effects – attachment no. 1
2. Programme of studies – attachment no. 2

Faculty Council Resolution of 26.09.2012

In effect since 01.10.2012

Update: Faculty Council Resolution of 10.07.2013

Edited adjustment\_April 2014

## PROGRAMME OF STUDIES

## 1. Description

<i>Number of semesters: 7</i>	<i>Number ECTS points necessary to obtain qualifications: 210</i>
<i>Prerequisites (particularly for second-level studies): matriculation examination in the following subjects: mathematics, physics and foreign language.</i>	<i>Upon completion of studies graduate obtains professional degree of: inżynier 1st level qualifications</i>
<i>Possibility of continuing studies: 2<sup>nd</sup> level of study</i>	<i>Graduate profile, employability: Has knowledge of engineering and design using computer techniques. Knows a foreign language at the B2 level. Is prepared to work in companies involved in the manufacture, processing and distribution of energy, and local government structures dealing with power engineering issues. Has the necessary knowledge and skills to perform engineering tasks, especially in the production of thermal energy.</i>
<i>Indicate connection with University's mission and its development strategy:</i>	<i>The curriculum is consistent with the mission of the university in the transfer of knowledge and skills to maintain high quality of education and realized one of the strategic objectives of which is to develop graduate profile for civil society.</i>

- 2. Fields of science and scientific disciplines to which educational effects apply:** Technical Sciences
- 3. Concise analysis of consistency between assumed educational effects and labor market needs:** Expected learning outcomes to ensure the achievement of knowledge and skills in mathematics, physics and chemistry of applied then to the knowledge and technical skills including social competences. The curriculum equips graduates with the attributes enabling him to adapt to the rapidly changing requirements of the labor market.

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup> KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup> Optional – enter W, obligatory – enter Ob

## 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 (min. 2 ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses lec	Way <sup>3</sup> of credit g cl	Course/group of courses			
			le c	c l	l a b	p r	s e m		ZZU	CNPS	total	BK classes 1			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	PRZ1153	Intellectual and Industrial Property Protection	1,07					K1ENG_W13	16	60	2	1	T	Z	O		KO	Ob
Total			1,07						16	60	2	1						

##### 4.1.1.4 Information technologies module (min. 2 ECTS points):

No.	Course/g roup of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses lec	Way <sup>3</sup> of credit g cl	Course/group of courses			
			le c	c l	l a b	p r	s e m		ZZU	CNPS	total	BK classes 1			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1450	Information Technologies	1,07					K1ENG_W06	16	60	2	1	T	Z	O		KO	Ob
2	ENN0580	Application packages			1,07			K1ENG_U02	16	60	2	1,5	T	Z	O	P	KO	Ob
Total			1,07		1,07				32	120	4	2,5						

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

<sup>5</sup>Practical 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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<sup>7</sup> Optional – enter W, obligatory – enter Ob

### 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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
2,14		1,07			48	180	6	3,5

## 4.1.2 List of basic sciences modules

### 4.1.2.1 Mathematics module

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MAP1076	Mathematics 1	2,13					K1ENG_W02	32	120	4	2	T	E	O		PD	Ob
2	MAP1076	Mathematics 1		1,07				K1ENG_U08	16	90	3	2,25	T	Z	O	P	PD	Ob
3	MAP1069	Mathematics 2	2,13					K1ENG_W01	32	120	4	2	T	E	O		PD	Ob
4	MAP1069	Mathematics 2		1,07				K1ENG_U07	16	90	3	2,25	T	Z	O	P	PD	Ob
5	MAP1159	Mathematics 3	1,07					K1ENG_W02	16	120	4	2	T	E	O		PD	Ob
6	MAP1159	Mathematics 3		1,07				K1ENG_U08	16	60	2	1,5	T	Z	O	P	PD	Ob
Total			5,33	3,21					128	600	20	12						

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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<sup>7</sup>Optional – enter W, obligatory – enter Ob

#### 4.1.2.2 Physics module

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	FZP2109	Physics 1	2,13					K1ENG_W03	32	120	4	2	T	E	O		PD	Ob
2	FZP2107	Physics 2	1,07					K1ENG_W03	16	60	2	1	T	E	O		PD	Ob
3	FZP2107	Physics 2		0,53				K1ENG_U09	8	30	1	0,75	T	Z	O	P	PD	Ob
4	FZP2114	Physics 3	0,53					K1ENG_W03	8	30	1	0,5	T	Z	O		PD	Ob
5	FZP2114	Physics 3			1,07			K1ENG_U09	16	60	2	1,5	T	Z	O	P	PD	Ob
Total			3,73	0,53	1,07				80	300	10	5,75						

#### 4.1.2.3 Chemistry module

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			lab	pr	sem	typ <sup>7</sup>
1	CHC3078	Chemistry	1,60					K1ENG_W04	24	90	3	1,5	T	Z	O		PD	Ob
2	CHC3078	Chemistry			0,53			K1ENG_U10	8	30	1	0,75	T	Z	O	P	PD	Ob
Total			1,07		0,53				24	120	4	2,25						

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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<sup>7</sup> Optional – enter W, obligatory – enter Ob

### 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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
10,13	3,74	1,6			232	1020	34	20

## 4.1.3 List of main-field-of-study modules

### 4.1.3.1 Obligatory main-field-of-study modules

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of creditin g cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN0371	Power industry machinery	1,07					K1ENG_W08	16	60	2	1	T	Z			K	Ob
2	ENN0210	Descriptive geometry	1,07					K1ENG_W07	16	60	2	1	T	Z			K	Ob
3	ENN0210	Descriptive geometry		0,53				K1ENG_U13	8	30	1	0,75	T	Z		P	K	Ob
4	ENN0940	Technical drawing				1,07		K1ENG_U13	16	60	2	1,5	T	Z		P	K	Ob
5	ENN0781	Basics of metrology and experiment techniques	0,53					K1ENG_W05	8	60	2	1	T	Z			K	Ob
6	ENN0781	Basics of metrology and experiment techniques		0,53				K1ENG_U11	8	30	1	0,75	T	Z		P	K	Ob
7	ENN0781	Basics of metrology and experiment techniques			1,07			K1ENG_U12	16	30	1	0,75	T	Z		P	K	Ob
8	ENN0701	Fundamentals of Materials Science	1,07					K1ENG_W09	16	90	3	1,5	T	E			K	Ob

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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9	ENN0420	Engineering Materials and Consumables	0,53					K1ENG_W09	8	30	1	0,5	T	Z			K	Ob
10	ENN0420	Engineering Materials and Consumables			0,53			K1ENG_U24	8	30	1	0,75	T	Z		P	K	Ob
11	ENN0761	Fundamentals of fluid mechanics	1,07					K1ENG_W10	16	60	2	1	T	Z			K	Ob
12	ENN0761	Fundamentals of fluid mechanics		1,07				K1ENG_U15 K1ENG_K04	16	30	1	0,75	T	Z		P	K	Ob
13	ENN0470	Fluid mechanics	1,07					K1ENG_W10	16	60	2	1	T	E			K	Ob
14	ENN0470	Fluid mechanics		0,53				K1ENG_U15 K1ENG_K04	8	30	1	0,75	T	Z		P	K	Ob
15	ENN0480	Fluid Mechanics - laboratory			1,07			K1ENG_U15 K1ENG_K04	16	60	2	1,5	T	Z		P	K	Ob
16	ENN0801	Basics of thermodynamics	1,07					K1ENG_W11	16	60	2	1	T	Z			K	Ob
17	ENN0801	Basics of thermodynamics		1,07				K1ENG_U16	16	30	1	0,75	T	Z		P	K	Ob
18	ENN1190	Thermodynamics	1,07					K1ENG_W11	16	60	2	1	T	E			K	Ob
19	ENN1190	Thermodynamics		0,53				K1ENG_U16	8	30	1	0,75	T	Z		P	K	Ob
20	ENN1200	Thermodynamics -lab.			1,07			K1ENG_U17 K1ENG_K04	16	60	2	1,5	T	Z		P	K	Ob
21	ENN0872	Heat transfer	1,07					K1ENG_W21	16	60	2	1	T	Z			K	Ob
22	ENN0872	Heat transfer		1,07				K1ENG_U28	16	60	2	1,5	T	Z		P	K	Ob
23	ENN1040	Combustion and fuels	1,07					K1ENG_W18 K1ENG_K02	16	90	3	1,5	T	E			K	Ob
24	ENN1040	Combustion and fuels		0,53				K1ENG_U25	8	30	1	0,75	T	Z		P	K	Ob
25	ENN1040	Combustion and fuels			0,53			K1ENG_U26 K1ENG_K04	8	30	1	0,75	T	Z		P	K	Ob
26	ENN0730	Fundamental mechanics and strength of materials	1,07					K1ENG_W12	16	30	1	0,5	T	Z			K	Ob
27	ENN0730	Fundamental mechanics and strength of materials		0,53				K1ENG_U18	8	30	1	0,75	T	Z		P	K	Ob
28	ENN0460	Mechanics and strength of materials	1,07					K1ENG_W12	16	60	2	1	T	Z			K	Ob
29	ENN0460	Mechanics and strength of materials		1,07				K1ENG_U18	16	60	2	1,5	T	Z		P	K	Ob
30	ENN0651	Fundamentals of Control Systems	1,07					K1ENG_W14	16	90	3	1,5	T	E			K	Ob

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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31	ENN0651	Fundamentals of Control Systems		1,07				K1ENG_U19	16	30	1	0,75	T	Z		P	K	Ob
32	ENN0651	Fundamentals of Control Systems			1,07			K1ENG_U20 K1ENG_K04	16	60	2	1,5	T	Z		P	K	Ob
33	ENN0660	Fundamentals of Electronics	0,53					K1ENG_W15	8	30	1	0,5	T	Z			K	Ob
34	ENN0660	Fundamentals of Electronics			0,53			K1ENG_U21 K1ENG_K04	8	30	1	0,75	T	Z		P	K	Ob
35	ENN0680	Electrical Engineering Fundamentals	1,07					K1ENG_W16	16	60	2	1	T	Z			K	Ob
36	ENN0680	Electrical Engineering Fundamentals		0,53				K1ENG_U22	8	30	1	0,75	T	Z		P	K	Ob
37	ENN0680	Electrical Engineering Fundamentals			0,53			K1ENG_U23	8	30	1	0,75	T	Z		P	K	Ob
38	ENN0400	Electrical machines and devices	1,07					K1ENG_W20	16	90	3	1,5	T	E			K	Ob
39	ENN0400	Electrical machines and devices			0,53			K1ENG_U27 K1ENG_K01 K1ENG_K04	8	30	1	0,75	T	Z		P	K	Ob
40	ENN0893	Power Distribution	1,07					K1ENG_W28	16	90	3	1,5	T	E			K	Ob
41	ENN0893	Power Distribution		0,53				K1ENG_U36	8	30	1	0,75	T	Z		P	K	Ob
42	ENN0621	Basics of Machine Design I	1,07					K1ENG_W22	16	60	2	1	T	Z			K	Ob
43	ENN0621	Basics of Machine Design I				0,53		K1ENG_U30 K1ENG_K04	8	60	2	1,5	T	Z		P	K	Ob
44	ENN0641	Basics of Machine Design II	1,07					K1ENG_W22	16	90	3	1,5	T	E			K	Ob
45	ENN0641	Basics of Machine Design II				0,53		K1ENG_U30 K1ENG_K04	8	60	2	1,5	T	Z		P	K	Ob
46	ENN0041	CAD			1,07			K1ENG_U13	16	60	2	1,5	T	Z		P	K	Ob
47	ENN0330	Energy Boilers	1,07					K1ENG_W25	16	90	3	1,5	T	E			K	Ob
48	ENN0330	Energy Boilers				1,07		K1ENG_U33	16	60	2	1,5	T	Z		P	K	Ob
49	ENN1090	Flue-gases cleaning techniques	1,07					K1ENG_W23	16	60	2	1	T	Z			K	Ob
50	ENN1090	Flue-gases cleaning techniques		0,53				K1ENG_U31	8	30	1	0,75	T	Z		P	K	Ob
51	ENN0122	Power and heat stations	1,07					K1ENG_W26	16	90	3	1,5	T	E			K	Ob
52	ENN0122	Power and heat stations			0,53			K1ENG_U34	8	30	1	0,75	T	Z		P	K	Ob

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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<sup>7</sup> Optional – enter W, obligatory – enter Ob



53	ENN0521	Power engineering metrology	1,07					K1ENG_W24	16	90	3	1,5	T	E			K	Ob
54	ENN0521	Power engineering metrology			1,60			K1ENG_U32	24	60	2	1,5	T	Z		P	K	Ob
55	ENN0033	Research and testing of machines and devices	0,53					K1ENG_W27	8	30	1	0,5	T	Z			K	Ob
56	ENN0033	Research and testing of machines and devices			1,07			K1ENG_U35	16	30	1	0,75	T	Z		P	K	Ob
57	ENN0101	Ecology	1,07					K1ENG_W19 K1ENG_K02	16	60	2	1	T	Z			K	Ob
58	ENN0171	Power engineering and environmental	0,53					K1ENG_W29 K1ENG_K02	8	30	1	0,5	T	Z			K	Ob
59	ENN1370	Engineering diploma seminar					1,07	K1ENG_U01 K1ENG_U03 K1ENG_U05 K1ENG_K01 K1ENG_K04	16	30	1	0,75	T	Z		P	K	Ob
Total			26,19	10,12	11,2	3,2	1,07		776	3030	101	61,25						

**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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
26,19	10,12	11,2	3,2	1,07	776	3030	101	61,25

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<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical 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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<sup>7</sup> Optional – enter W, obligatory – enter Ob

## 4.2 List of optional modules

### 4.2.1 List of general education modules

#### 4.2.1.1 Liberal-managerial subjects modules (min. 4 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of creditin g cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	HNN100100BK	Liberal subject	0,53					KIENG_W30 KIENG_K02 KIENG_K06	8	30	1	0,5	T	Z	O		KO	W
2	HNN100100BK	Liberal subject	1,07					KIENG_W30 KIENG_K02 KIENG_K06	16	60	2	1	T	Z	O		KO	W
3	ZNN100100BK	Managerial since	0,53					KIENG_W30 KIENG_K05	8	30	1	0,5	T	Z	O		KO	W
Total			2,13						32	120	4	2						

#### 4.2.1.2 Foreign languages module (min. 5 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of creditin g cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	JZL100655BK	Foreign language B2.1.1		1,60				KIENG_U06	24	30	1	0,75	T	Z	O		KO	W
2	JZL100655BK	Foreign language B2.1.2		1,60				KIENG_U06	24	30	1	0,75	T	Z	O		KO	W
3	JZL100655BK	Foreign language B2.2		1,60				KIENG_U06	24	90	3	2,25	T	Z	O		KO	W
Total				4,80					72	150	5	3,75						

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

### 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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
2,13	4,80				104	270	9	5,75

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

### 4.2.3.1 Advanced Project methods module (min. 3 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN0065	CATIA			1,07			KIENG_U13					T	Z		P	K	W
2	ENN1032	Solid Edge			1,07			KIENG_U13					T	Z		P	K	W
3	ENN0242	Grafika 3D			1,07			KIENG_U13 KIENG_U05 KIENG_K06					T	Z		P	K	W
Total					3,21				16	90	3	2.25						

### 4.2.3.2 Individual Engineering Project module (min. 4 ECTS points):

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of creditin g cl	Course/group of courses			
			le c	c l	l a b	p r	s e m		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1351	Individual Engineering project				4,00		KIENG_U01 KIENG_U03 KIENG_U04 KIENG_K01	60	120	4	1	T	Z		P	K	W
		Total				4,00			60	120	4	1						

#### 4.2.3.3 Training module (min. 4 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of creditin g cl	Course/group of courses			
			l e c	c l	l a b	p r	s e m		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1410	Training						KIENG_U03 KIENG_K04 KIENG_K05			4	0			P	K	W	
		Total								120	4	0						

#### 4.2.3.4 Engineer diploma dissertation module (min. 15 ECTS points):

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1420	Engineer diploma disseration						KIENG_U01 KIENG_U03 KIENG_U04 KIENG_U05 KIENG_K01 KIENG_K04 KIENG_K06	450	15	2	T	Z		P		W	
Total									450	15	2							

**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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
		5,07			76	780	22	5,25

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

## 4.2.4 List of specialization modules

### 4.2.4.1 Specialization subjects (e.g. whole specialization) modules (min.34 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses lec	Way <sup>3</sup> of crediting cl	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN0410	Turbomachinery	1,07					S1EEN_W02	16	90	3	1,5	T	E			S	W
2	ENN0410	Turbomachinery		1,07				S1EEN_U02	16	60	2	1,5	T	Z		P	S	W
3	ENN0410	Turbomachinery				0,53		S1EEN_U03	8	30	1	0,75	T	Z		P	S	W
4	ENN0850	Pumps and pumping systems	1,07					S1EEN_W01	16	60	2	1	T	Z			S	W
5	ENN0850	Pumps and pumping systems		0,53				S1EEN_U01	8	30	1	0,75	T	Z		P	S	W
6	ENN0321	Energy Conversion	1,07					S1EEN_W07	16	60	2	1,5	T	Z			S	W
7	ENN0321	Energy Conversion			0,53			S1EEN_U08	8	30	1	0,75	T	Z		P	S	W
8	ENN0082	Refrigeration and Cryogenics	1,07					S1EEN_W03	16	90	3	1	T	E			S	W
9	ENN0082	Refrigeration and Cryogenics			1,07			S1EEN_U04	16	60	2	1,5	T	Z		P	S	W
10	ENN0201	Gas technologies	0,53					S1EEN_W05	8	30	1	0,5	T	Z			S	W
11	ENN0201	Gas technologies		0,53				S1EEN_U05	8	30	1	0,75	T	Z		P	S	W
12	ENN0832	Heat pumps and solar collectors	0,53					S1EEN_W06	8	30	1	0,5	T	Z			S	W
13	ENN0832	Heat pumps and solar collectors			0,53			S1EEN_U06	8	30	1	0,75	T	Z		P	S	W
14	ENN0832	Heat pumps and solar collectors				0,53		S1EEN_U07	8	30	1	0,75	T	Z		P	S	W
15	ENN0690	Basics of air-conditioning	1,07					S1EEN_W04	16	60	2	1	T	Z			S	W
16	ENN0010	Energy audit	0,53					S1EEN_W11	8	30	1	0,5	T	Z			S	W

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

17	ENN0010	Energy audit			0,53			S1EEN_U12	8	30	1	0,75	T	Z		P	S	W
18	ENN0972	Heat distribution networks	0,53					S1EEN_W10	8	30	1	0,5	T	Z			S	W
19	ENN0972	Heat distribution networks		0,53				S1EEN_U11	8	30	1	0,75	T	Z		P	S	W
20	ENN0340	Boilers and Small Power	1,07					S1EEN_W09	16	60	2	1	T	Z			S	W
21	ENN0340	Boilers and Small Power		0,53				S1EEN_U10	8	30	1	0,75	T	Z		P	S	W
22	ENN0230	Energy management	1,07					S1EEN_W08	16	60	2	1	T	Z			S	W
23	ENN0230	Energy management		0,53				S1EEN_U09	8	30	1	0,75	T	Z		P	S	W
Total			9,61	3,72	2,66	1,06			256	1020	34	20,5						

**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 for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
9,61	3,72	2,66	1,06		256	1020	34	20,5

**4.3 Training module (Faculty Council resolution on principles of crediting training – attachment no. 1)**

Name of training			
Number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>	Number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
<b>4</b>	<b>0</b>	<b>Opinia zakładowego opiekuna praktyki i przygotowanie sprawozdania z praktyki</b>	<b>ESN1410</b>
Training duration		Training objective	
<b>4 weeks</b>		to familiarize with the methods of operation of equipment and production, and the procedures and methods of work organization, to confront knowledge with the practice and to use knowledge for solving attributed tasks	

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob

#### 4.4 Diploma dissertation module

Type of diploma dissertation	inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code
1	15	ESN1420
Character of diploma dissertation		
experimental / design		
Number of BK <sup>1</sup> ECTS points	2	

#### 5. Ways of verifying assumed educational effects

Type of classes	Ways of verifying assumed educational effects
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

5. 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<sup>1</sup>)

**116,25 ECTS points**

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup>KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup>Optional – enter W, obligatory – enter Ob



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

Number of ECTS points for obligatory subjects.	34
Number of ECTS points for optional subjects	0
Total number of ECTS points	34

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

Number of ECTS points for obligatory subjects . including laboratory classes and project	57 26
Number of ECTS points for optional subjects including laboratory classes and project <i>including diploma dissertation</i>	36 14 15
Total number of ECTS points	93

**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** (enter number of ECTS points for courses/groups of courses denoted with code OG)

**49 ECTS points**

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

**39 ECTS points**

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup> KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup> Optional – enter W, obligatory – enter Ob

## 11. Range of diploma dissertation

### 1. Zagadnienia teoretyczne

- 1.1. Podstawowe równania mechaniki płynów – zasada zachowania masy, pędu i energii.
- 1.2. Równanie Bernoulliego dla płynu doskonałego i jego zastosowanie.
- 1.3. Przepływy laminarne i turbulenty. Rozkłady prędkości przepływu w przewodzie.
- 1.4. Charakterystyka przepływu w pojedynczym przewodzie i szeregowym systemie hydraulicznym. Rozkład energii wzdłuż rurociągu – wykres Ancony
- 1.5. Pierwsza i druga zasada termodynamiki (entropia, zjawiska odwracalne i nieodwracalne).
- 1.6. Przemiany charakterystyczne gazu doskonałego. Równanie stanu gazu. Gaz wilgotny.
- 1.7. Przemiany charakterystyczne pary wodnej (układ p-v, T-s oraz i-s).
- 1.8. Siłownia parowa (Obieg Clausiusa – Rankine’a). Metody podwyższenia sprawności obiegu C-R.
- 1.9. Przewodzenie i przenikanie ciepła. Promieniowanie cieplne – podstawowe prawa. Rodzaje wymiany ciepła – podstawowe równania je opisujące. Przekazywanie ciepła.
- 1.10. Spalanie paliw stałych, ciekłych i gazowych - specyfika spalania, stechiometria
- 1.11 Charakterystyka podstawowych regulatorów o działaniu ciągłym
- 1.12. Sprężanie gazów, określenie sprawności sprężania, poprawa sprawności obiegu

### 2. Zagadnienia konstrukcyjno-technologiczne

- 2.1. Kotły rusztowe (wodne i parowe) w energetyce komunalnej i przemysłowej
- 2.2. Kotły parowe dużej wydajności - podział kotłów ze względu na konstrukcję komory paleniskowej i parametry pracy
- 2.3. Turbiny parowe i turbiny gazowe – rodzaje i konstrukcje turbin, zasada działania, sprawność stopnia
- 2.4. Typy palników stosowanych w kotłach małej mocy
- 2.5. Sposoby zabezpieczenia kotłów małej mocy przed zbyt niską temperaturą wody powrotnej
- 2.6. Wymienniki ciepła w procesach przemysłowych (rodzaje, budowa, zasada pracy, zastosowania)
- 2.7. Klimatyzatory i systemy klimatyzacyjne
- 2.8. Pompy ciepła
- 2.9. Kolektory słoneczne i fotoogniwa
- 2.10. Techniki redukcji zanieczyszczeń pyłowych i gazowych w spalinach emitowanych do atmosfery
- 2.11. System elektroenergetyczny i jego elementy składowe
- 2.12. Sprężarkowy jednostopniowy system ziębniczy ( elementy składowe, ograniczenia, wymagania)

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup> KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup> Optional – enter W, obligatory – enter Ob

### 3. Zagadnienia eksploatacyjne

- 3.1. Metody pomiaru ciśnienia, temperatury i przepływu płynu
- 3.2. Charakterystyki wentylatora, punkt pracy, metody regulacji parametrów pracy wentylatora
- 3.3. Charakterystyki pomp wirowych, metody regulacji i zasady doboru pomp do układu pompowego.
- 3.4. Rozruch i odstawianie bloku energetycznego – ogólne zasady
- 3.5. Pomiary energetyczne silników lub urządzeń cieplnych, ocena niepewności pomiarów – na wybranym przykładzie.
- 3.6. Zagadnienia dotyczące budowy i eksploatacji siłowni cieplnych - konwencjonalnych
- 3.7. Zasady eksploatacji sieci cieplnych
- 3.8. Oddziaływanie elektrowni konwencjonalnych na środowisko
- 3.9. Wpływ techniki spalania i rodzaju paliwa na emisję zanieczyszczeń do atmosfery
- 3.10. Wytwarzanie tlenu na potrzeby energetyki w technologii *oxy-fuel*,
- 3.11. Zasady bilansowania ciepłego pomieszczeń
- 3.12. Zasady określania zużycia gazu przez grupy odbiorców

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

<i>No.</i>	<i>Course code</i>	<i>Name of course</i>	<i>Crediting by deadline of... (number of semester)</i>
	Faculty Council Resolution No 4/D/2008 of 19.09.2008	The condition for admission the student to the execution of the <i>master thesis</i> module is to pass all subjects in plan of studies in the semester prior to the semester of graduation	

### 13. Plan of studies (attachment no. 2)

<sup>1</sup>BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

<sup>2</sup>Traditional – enter T, remote – enter Z

<sup>3</sup>Exam – 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)

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

<sup>5</sup>Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

<sup>6</sup> KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

<sup>7</sup> Optional – enter W, obligatory – enter Ob