

## **PROGRAMME OF STUDIES**

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: POWER ENGINEERING

in area of technical science

EDUCATION LEVEL: 1st level, Engineer

FORM OF STUDIES: part-time

PROFILE: general academic

SPECIALIZATION: **THERMAL POWER ENGINEERING**

LANGUAGE OF STUDY: polish

Content:

1. Plan of studies – attachment no. 1

## PROGRAMME OF STUDIES

### 1. Description

<i>Number of semesters: 8</i>	<i>Number ECTS points necessary to obtain qualifications: 240</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 studies</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.

## 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 GK)	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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	PRZ0330W	Intellectual and Industrial Property Protection	1,2					K1ENG_W13	18	60	2	1	T	Z	O		KO	Ob
		Total	1,2						18	60	2	1						

##### 4.1.1.2. Information Technologies module (min. 3ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1455	Information Technologies	1,2					K1ENG_W06	18	60	2	1	T	Z	O		KO	Ob
2	ENN0585	Application Packages			0,6			K1ENG_U02	9	30	1	0,75	T	Z	O	P	KO	Ob
		Total	1,2		0,6				27	90	3	1,75						

##### 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				
2,4		0,6			45	150	5	2,75

<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

## 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cj	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	MAT1487	Mathematic 1	1,2					K1ENG_W02 K1ENG_K01	18	120	4	2	T	E	O		PD	Ob
2	MAT1487	Mathematic 1		1,2				K1ENG_U08 K1ENG_K01	18	120	4	3	T	Z	O	P	PD	Ob
3	MAT1489	Mathematic 2	1,2					K1ENG_W01 K1ENG_W02 K1ENG_K01	18	120	4	2	T	E	O		PD	Ob
4	MAT1489	Mathematic 2		1,2				K1ENG_U07 K1ENG_U08 K1ENG_K01	18	120	4	3	T	Z	O	P	PD	Ob
5	MAT1547	Mathematic 3	1,8					K1ENG_W01 K1ENG_W02 K1ENG_K01	27	150	5	2,5	T	E	O		PD	Ob
6	MAT1547	Mathematic 3		1,2				K1ENG_U07 K1ENG_U08 K1ENG_K01	18	120	4	3	T	Z	O	P	PD	Ob
Total			4,2	3,6					117	750	25	15,5						

<sup>1</sup>BK – liczba punktów ECTS przypisanych godzinom zajęć wymagających bezpośredniego kontaktu nauczycieli i studentów

<sup>2</sup>Tradycyjna – T, zdalna – Z

<sup>3</sup>Egzamin – E, zaliczenie na ocenę – Z. W grupie kursów po literze E lub Z w nawiasie wpisać formę kursu końcowego (w, c, l, s, p)

<sup>4</sup>Kurs/ grupa kursów Ogólnouczelniany – O

<sup>5</sup>Kurs/ grupa kursów Praktyczny – P. W grupie kursów w nawiasie wpisać liczbę punktów ECTS dla kursów o charakterze praktycznym

<sup>6</sup>KO - kształcenia ogólnego, PD – podstawowy, K – kierunkowy, S – specjalnościowy

<sup>7</sup>W - wybieralny, Ob – obowiązkowy

### 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	FZP009078	Physics 1	1,2					K1ENG_W03	18	120	4	2	T	E	O		PD	Ob
2	FZP009079	Physics 2	1,2					K1ENG_W03	18	120	4	2	T	E	O		PD	Ob
3	FZP009079	Physics 2		1,2				K1ENG_U09	18	60	2	1,5	T	Z	O	P	PD	Ob
4	FZP009080	Physics 3			1,2			K1ENG_U09	18	60	2	1,5	T	Z	O	P	PD	Ob
Total			2,4	1,2	1,2				72	360	12	7						

### 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	CHC003080	Chemistry	1,2					K1ENG_W04	18	60	2	1,5	T	Z	O		PD	Ob
2	CHC003080	Chemistry			0,6			K1ENG_U10	9	30	1	0,75	T	Z	O	P	PD	Ob
Total			1,2		0,6				27	90	3	1,75						

### 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				
7,8	4,8	1,8			216	1200	40	24,25

<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

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

#### 4.1.3.1. Obligatory main-field-of-study 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1375	Power Industry Machinery	1,2					K1ENG_W08	18	60	2	1	T	Z			K	Ob
2	ENN0215	Descriptive Geometry	1,2					K1ENG_W07	18	60	2	1	T	Z			K	Ob
3	ENN0215	Descriptive Geometry		0,6				K1ENG_U13	9	60	2	1,5	T	Z		P	K	Ob
4	ENN0785	Basics of Metrology and Experiment Techniques	1,2					K1ENG_W05	18	60	2	1	T	Z			K	Ob
5	ENN0785	Basics of Metrology and Experiment Techniques		0,6				K1ENG_U11 K1ENG_U12	9	60	2	1,5	T	Z		P	K	Ob
6	ENN0785	Basics of Metrology and Experiment Techniques			0,6			K1ENG_U11 K1ENG_U12	9	30	1	0,75	T	Z		P	K	Ob
7	ENN0715	Fundamentals of Materials Science	1,2					K1ENG_W09	18	120	4	2	T	E			K	Ob
8	ENN0945	Technical Drawing				1,2		K1ENG_U13	18	120	4	3	T	Z		P	K	Ob
9	ENN0805	Basics of Thermodynamics	1,2					K1ENG_W11	18	60	2	1	T	Z			K	Ob.
10	ENN0805	Basics of Thermodynamics		0,6				K1ENG_U16	9	60	2	1,5	T	Z		P	K	Ob
11	ENN0765	Fundamentals of Fluid Mechanics	1,2					K1ENG_W10	18	60	2	1	T	Z			K	Ob
12	ENN0765	Fundamentals of Fluid Mechanics		0,6				K1ENG_U14	9	60	2	1,5	T	Z		P	K	Ob
13	ENN0735	Fundamental Mechanics And Strength of Materials	0,6					K1ENG_W12	9	30	1	0,5	T	Z			K	Ob
14	ENN0735	Fundamental Mechanics and Strength of Materials		0,6				K1ENG_U18	9	60	2	1,5	T	Z		P	K	Ob
15	ENN0475	Fluid Mechanics	0,6					K1ENG_W10	9	90	3	1,5	T	E			K	Ob
16	ENN0475	Fluid Mechanics		0,6				K1ENG_U14	9	30	1	0,75	T	Z		P	K	Ob
17	ENN0475	Fluid Mechanics -lab.			1,2			K1ENG_U15	18	60	2	1,5	T	Z		P	K	Ob
18	ENN1045	Combustion and Fuels	1,2					K1ENG_W18	18	120	4	2	T	E			K	Ob
19	ENN1045	Combustion and Fuels		0,6				K1ENG_U25	9	30	1	0,75	T	Z		P	K	Ob
20	ENN1045	Combustion and Fuels			0,6			K1ENG_U26	9	30	1	0,75	T	Z		P	K	Ob
21	ENN0685	Fundamentals of Electrical Engineering	1,2					K1ENG_W16	18	60	2	1	T	Z			K	Ob
22	ENN0685	Fundamentals of Electrical Engineering		0,6				K1ENG_U22	9	60	2	1,5	T	Z		P	K	Ob
23	ENN0685	Fundamentals of Electrical Engineering			0,6			K1ENG_U23	9	30	1	0,75	T	Z		P	K	Ob
24	ENN0465	Mechanics and Strength of Materials	1,2					K1ENG_W12	18	60	2	1	T	Z			K	Ob
25	ENN0485	Mechanics and Strength of Materials		1,2				K1ENG_U18	18	60	2	1,5	T	Z		P	K	Ob
26	ENN0415	Turbomachinery	1,2					K1ENG_W30	18	120	4	2	T	E			K	Ob
27	ENN0415	Turbomachinery				0,6		K1ENG_U37 K1ENG_U29	9	60	2	1,5	T	Z		P	K	Ob

<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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
28	ENN1195	Thermodynamics	0,6					K1ENG_W11	9	90	3	1,5	T	E			K	Ob
29	ENN1195	Thermodynamics		0,6				K1ENG_U16	9	30	1	0,75	T	Z		P	K	Ob
30	ENN1195	Thermodynamics – lab.			1,2			K1ENG_U17 K1ENG_K04	18	60	2	1,5	T	Z		P	K	Ob
31	ENN0875	Heat Transfer	1,2					K1ENG_W21	18	60	2	1	T	Z			K	Ob
32	ENN0875	Heat Transfer		1,2				K1ENG_U28	18	90	3	2,25	T	Z		P	K	Ob
33	ENN0655	Fundamentals of Control Systems	1,2					K1ENG_W14	18	120	4	2	T	E			K	Ob
34	ENN0655	Fundamentals of Control Systems		0,6				K1ENG_U19	9	30	1	0,75	T	Z		P	K	Ob
35	ENN0655	Fundamentals of Control Systems			1,2			K1ENG_U20 K1ENG_K04	18	60	2	1,5	T	Z		P	K	Ob
36	ENN0666	Fundamentals of Electronics	0,6					K1ENG_W15	9	60	2	1	T	Z			K	Ob
37	ENN0666	Fundamentals of Electronics			0,6			K1ENG_U21	9	30	1	0,75	T	Z		P	K	Ob
38	ENN0525	Power Engineering Metrology	1,2					K1ENG_W24	18	120	4	2	T	E			K	Ob
39	ENN0525	Power Engineering Metrology			1,2			K1ENG_U32	18	60	2	1,5	T	Z		P	K	Ob
40	ENN0335	Utility Boilers	1,2					K1ENG_W25	18	120	4	2	T	E			K	Ob
41	ENN0335	Utility Boilers				0,6		K1ENG_U33 K1ENG_U29	9	60	2	1,5	T	Z		P	K	Ob
42	ENN0625	Basics of Machine Design I	1,2					K1ENG_W22	18	60	2	1	T	Z			K	Ob
43	ENN0625	Basics of Machine Design I				0,6		K1ENG_U30	9	60	2	1,5	T	Z		P	K	Ob
44	ENN0645	Basics of Machine Design II	1,2					K1ENG_W22	18	150	5	2,5	T	E			K	Ob
45	ENN0645	Basics of Machine Design II				0,6		K1ENG_U30	9	60	2	1,5	T	Z		P	K	Ob
46	ENN0045	CAD			1,2			K1ENG_U13	18	60	2	1,5	T	Z		P	K	Ob
47	ENN0425	Engineering Materials and Consumables	0,6					K1ENG_W17	9	30	1	0,5	T	Z			K	Ob
48	ENN0425	Engineering Materials and Consumables			0,6			K1ENG_U24	9	30	1	0,75	T	Z		P	K	Ob
49	ENN1095	Flue-gases Cleaning Techniques	1,2					K1ENG_W23	18	60	2	1	T	Z			K	Ob
50	ENN1095	Flue-gases Cleaning Techniques		0,6				K1ENG_U31	9	60	2	1,5	T	Z		P	K	Ob
51	ENN0405	Electrical Machines and Devices	1,2					K1ENG_W20	18	150	5	2,5	T	E			K	Ob
52	ENN0405	Electrical Machines and Devices			0,6			K1ENG_U27 K1ENG_K01 K1ENG_K04	9	30	1	0,75	T	Z		P	K	Ob
53	ENN0895	Power Distribution	1,2					K1ENG_W28	18	90	3	1,5	T	E			K	Ob
54	ENN0895	Power Distribution		0,6				K1ENG_U36	9	30	1	0,75	T	Z		P	K	Ob
55	ENN0123	Power and Heat Stations	1,2					K1ENG_W26	18	90	3	1,5	T	E			K	Ob
56	ENN0123	Power and Heat Stations			0,6			K1ENG_U34	9	30	1	0,75	T	Z		P	K	Ob
57	ENN0115	Ecology	1,2					K1ENG_W19 K1ENG_K02	18	60	2	1	T	Z			K	Ob

<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	Way <sup>3</sup> of crediting	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>
58	ENN0175	Power Engineering and Environmental	0,6					K1ENG_W29 K1ENG_K02	9	30	1	0,5	T	Z			K	Ob
59	ENN0035	Research and Testing of Machines and Devices	0,6					K1ENG_W27	9	30	1	0,5	T	Z			K	Ob
60	ENN0035	Research and Testing of Machines and Devices			0,6			K1ENG_U35	9	30	1	0,75	T	Z		P	K	Ob
61	ENN1373	Engineer Diploma Seminar					0,6	K1ENG_U01 K1ENG_U03 K1ENG_U05 K1ENG_K01 K1ENG_K04	9	30	1	0,75	T	Z		P	K	Ob
Total			29,4	9,6	10,8	3,6	0,6		810	3870	129	78,25						

### 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				
29,4	9,6	10,8	3,6	0,6	810	3870	129	78,25

<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. List of optional modules:

### 4.2.1. List of general education modules

#### 4.2.1.1. Liberal-managerial subjects module (min.5 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol GK)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	HNN100300BK	Humanities	0,6					K1ENG_W31 K1ENG_K02 K1ENG_K03 K1ENG_K06	9	30	1	0,5	T	Z	O		KO	W
2	HNN100300BK	Humanities	1,2					K1ENG_W31 K1ENG_K02 K1ENG_K03 K1ENG_K06	18	90	3	1,5	T	Z	O		KO	W
3	ZNN100300BK	Management Science	0,6					K1ENG_W31 K1ENG_K05	9	30	1	0,5	T	Z	O		KO	W
Total			2,4						36	150	5	2,5						

#### 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 GK)	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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	JZL100789C JZL100792C JZL100845C	Foreign Language B2.1		2,4				K1ENG_U06	36	60	2	1,5	T	Z	O	P	KO	W
2	JZL100790C JZL100793C JZL100844C	Foreign Language B2.2		2,4				K1ENG_U06	36	90	3	2,25	T	Z	O	P	KO	W
Total				4,8					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

### 4.2.1.3. Sporting classes 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>

### 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				
2,4	4,8				108	300	10	6,25

## 4.2.2. List of main-field-of-study modules

### 4.2.2.1. Advanced design 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
		Advanced Design Methods:			1,2			18	90	3	2,25	T	Z		P	K	W	
	ENN0066	CATIA					K1ENG_U13											
	ENN1035	Solid Edge					K1ENG_U13											
	ENN0245	3D Graphic					K1ENG_U13 K1ENG_U05 K1ENG_K06											
		Total			1,2			18	90	3	2,25							

<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

**4.2.2.2. Engineer individual student project 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1355	Engineer Individual Student Project				4		K1ENG_U01 K1ENG_U03 K1ENG_U04 K1ENG_K01	60	120	4	1	T	Z		P	K	W
Total						4			60	120	4	1						

**4.2.2.3. Professional practice 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1415	Professional Practice						K1ENG_U03 K1ENG_K04 K1ENG_K05		120	4	0	T	Z		P	K	W
Total										120	4	0						

**4.2.2.4. Engineer thesis module (min. 15 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN1425	Engineer Thesis						K1ENG_U01 K1ENG_U03 K1ENG_U04 K1ENG_U05 K1ENG_K01 K1ENG_K04 K1ENG_K06		450	15	2	T	Z		P		W
Total										450	15	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

**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				
		1,2	4		78	780	26	5,25

**4.2.3. List of specialization modules**

**4.2.3.1. Specialization subjects module (min. 30 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	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ENN0085	Refrigeration and Cryogenics	1,2					S1ENC_W03	18	120	4	2	T	E			S	W
2	ENN0085	Refrigeration and Cryogenics		0,6				S1ENC_U04	9	30	1	0,75	T	Z		P	S	W
3	ENN0835	Heat Pumps and Solar Collectors	0,6					S1ENC_W06	9	30	1	0,5	T	Z			S	W
4	ENN0835	Heat Pumps and Solar Collectors			0,6			S1ENC_U06	9	30	1	0,75	T	Z		P	S	W
5	ENN0835	Heat Pumps and Solar Collectors				0,6		S1ENC_U07	9	30	2	1,5	T	Z		P	S	W
6	ENN0325	Energy Conversion	1,2					S1ENC_W07	18	90	3	1,5	T	Z			S	W
7	ENN0325	Energy Conversion			0,6			S1ENC_U08	9	30	1	0,75	T	Z		P	S	W
8	ENN0695	Basics of Air-conditioning	0,6					S1ENC_W04	9	30	1	0,5	T	Z			S	W
9	ENN0695	Basics of Air-conditioning			0,6			S1ENC_U12	9	30	1	0,75	T	Z		P	S	W
10	ENN0855	Pumps and Pumping Systems	1,2					S1ENC_W01	18	60	2	1	T	Z			S	W
11	ENN0855	Pumps and Pumping Systems		0,6				S1ENC_U01	9	30	1	0,75	T	Z		P	S	W
12	ENN0345	Boilers and Small Power	0,6					S1ENC_W09	9	30	1	0,5	T	Z			S	W
13	ENN0345	Boilers and Small Power			0,6			S1ENC_U10	9	30	1	0,75	T	Z		P	S	W
14	ENN0015	Energy Audit	0,6					S1ENC_W11	9	30	1	0,5	T	Z			S	W
15	ENN0015	Energy Audit			0,6			S1ENC_U12	9	30	1	0,75	T	Z		P	S	W
16	ENN0205	Gas Technologies	0,6					S1ENC_W05	9	30	1	0,5	T	Z			S	W
17	ENN0205	Gas Technologies		0,6				S1ENC_U05	9	30	1	0,75	T	Z		P	S	W
18	ENN0235	Energy Management	1,2					S1ENC_W08	18	30	1	0,5	T	Z			S	W
19	ENN0235	Energy Management		0,6				S1ENC_U09	9	30	1	0,75	T	Z		P	S	W
20	ENN0165	Nuclear Power Engineering	1,2					S1ENC_W02	18	30	1	0,5	T	Z			S	W
21	ENN0165	Nuclear Power Engineering		0,6				S1ENC_U02	9	30	1	0,75	T	Z		P	S	W
22	ENN0975	Heat Distribution Networks	0,6					S1ENC_W10	9	30	1	0,5	T	Z			S	W
23	ENN0975	Heat Distribution Networks		0,6				S1ENC_U11	9	30	1	0,75	T	Z		P	S	W
Total			9,6	3,6	3	0,6			252	900	30	18,25						

<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

**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				
9,6	3,6	3	0,6	0	252	900	30	18,25

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

Name of training		Praktyka zawodowa	
Number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>	Training crediting mode	Code
4	0	Opinion from training tutor and a report from practice	ENN1415
Training duration		Training objective	
4 weeks		<ul style="list-style-type: none"> <li>- to familiarize with the methods of operation of equipment and production, and the procedures and methods of work organization,</li> <li>- to confront knowledge with the practice and</li> <li>- to use knowlege for solving attributed tasks</li> </ul>	

**4.4. Diploma dissertation module**

Type of diploma dissertation	inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code
1	15	ENN1425
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	exam, progress and final test
class	progress and final tests

laboratory	pretest, report from laboratory
project	project defence
seminar	participation in discussion, topic presentation, essay
training	report from training
diploma dissertation	evaluation of 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<sup>1</sup>)**

**135 ECTS points**

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

Number of ECTS points for obligatory subjects.	40
Number of ECTS points for optional subjects	0
Total number of ECTS points	40

**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	34	73
Number of ECTS points for optional subjects Including: laboratory classes and project diploma dissertation	14 15	44
Total number of ECTS points		117

**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 O)**

**55 ECTS points**

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

**66 ECTS points (27,5%)**

**11. Range of the diploma exam**

## **1. Theoretical problems**

- 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. Przewodzenie i przenikanie ciepła. Promieniowanie cieplne – podstawowe prawa. Rodzaje wymiany ciepła – podstawowe równania je opisujące.
- 1.9. Sprężanie gazów, określenie sprawności sprężania, poprawa sprawności obiegu
- 1.10. Spalanie paliw stałych, ciekłych i gazowych - specyfika spalania, stechiometria

## **2. Construction and technological problems**

- 2.1. Obieg Clausiusa – Rankine’a, metody podwyższenia sprawności obiegu C-R
- 2.2. Obiegi ziębnicze i obiegi kriogeniczne
- 2.3. Podstawy procesów inżynierii chemicznej: destylacja i rektyfikacja, absorpcja i desorpcja, ekstrakcja, adsorpcja
- 2.4. Analiza procesu sprężania w sprężarce wielostopniowej
- 2.5. Wymienniki ciepła w procesach przemysłowych (rodzaje, budowa, zasada pracy, zastosowania)
- 2.6. Kotły rusztowe w energetyce cieplnej - wodne i parowe
- 2.7. Kotły parowe dużej wydajności- podział kotłów ze względu na konstrukcję komory paleniskowej i parametry pracy
- 2.8. Turbiny parowe i gazowe– rodzaje i konstrukcje turbin, zasada działania, sprawność stopnia
- 2.9. Gazowe objętościowe maszyny energetyczne (rodzaje, budowa, zasada działania)
- 2.10. Techniki ograniczania emisji substancji zanieczyszczających do atmosfery – urządzenia i instalacje

## **3. Operational problems**

- 3.1. Pomiar ciśnienia, temperatury i przepływu płynu
- 3.2. Oznaczanie wilgotności i gęstości gazu
- 3.3. Charakterystyki pracy wentylatora, punkt pracy, metody regulacji parametrów pracy
- 3.4. Charakterystyki pracy pompy wodnej, punkt pracy, metody regulacji parametrów pracy
- 3.5. Oddziaływanie siłowni cieplnych na środowisko (powietrze, woda, gleba)
- 3.6. Określanie sprawności eksploatacyjnej kotłów energetycznych
- 3.7. Określanie sprawności eksploatacyjnej turbin parowych
- 3.8. Problemy eksploatacyjne reaktorów jądrowych
- 3.9. Sterowanie procesami cieplnymi – regulatory PID, sterowniki PLC

3.10. Spalanie i współspalanie biomasy w kotłach – problemy eksploatacyjne

**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. 1)**