PROGRAMME OF EDUCATION

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: POWER ENGINEERING

in area of technical science

EDUCATION LEVEL: 1st level, Engineer

FORM OF STUDIES: full-time

PROFILE: general academic

SPECIALIZATION: **THERMAL POWER ENGINEERING**

LANGUAGE OF STUDY: polish

Content:

Faculty Council Resolution of 30.09.2015
In effect since 01.10.2015

PROGRAMME OF STUDIES

1. Description

Number of semesters: 7	*Number ECTS points necessary to obtain qualifications:* 210
Prerequisites (particularly for second-level studies): matriculation examination in the following subjects: mathematics, physics and foreign language.	*Upon completion of studies graduate obtains professional degree of:* inżynier 1st level qualifications
Possibility of continuing studies: 2nd level studies	*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.
Indicate connection with University's mission and its development strategy:	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.

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	PRZ1152	Intellectual and Industrial Property Protection	2					K1ENG_W13	30	60	2	1	T	Z	O		KO	Ob
		Total	2						30	60	2	1						

4.1.1.2. *Information Technologies* **module** *(min. 4 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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	INN1004	Information Technologies	2					K1ENG_W06	30	60	2	1	T	Z	O		KO	Ob
2	INN1003	Application Packages			2			K1ENG_U02	30	60	2	1,5	T	Z	O	P	KO	Ob
		Total	2		2				60	120	4	2,5						

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[1]
lec	cl	lab	pr	sem				
4		2			90	180	6	3,5

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] 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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	MAP3075	Mathematical Analysis 1A	2					K1ENG_W02 K1ENG_K01	30	150	5	2,5	T	E	O		PD	Ob
2	MAP3075	Mathematical Analysis 1A		2				K1ENG_U08 K1ENG_K01	30	90	3	2,25	T	Z	O	P	PD	Ob
3	MAP3074	Algebra and Analytic Geometry	2					K1ENG_W01 K1ENG_K01	30	60	2	1	T	E	O		PD	Ob
4	MAP3074	Algebra and Analytic Geometry		1				K1ENG_U07 K1ENG_K01	15	60	2	1,5	T	Z	O	P	PD	Ob
5	MAP3076	Mathematical Analysis 2.2A	3					K1ENG_W02 K1ENG_K01	45	150	5	2,5	T	E	O		PD	Ob
6	MAP3076	Mathematical Analysis 2.2A		2				K1ENG_U08 K1ENG_K01	30	90	3	2,25	T	Z	O	P	PD	Ob
		Total	7	5					180	600	20	12						

4.1.2.2. *Physics* module

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	FZP1065	Physics 1.6	2					K1ENG_W03 K1ENG_K01 K1ENG_K02 K1ENG_K03 K1ENG_K04	30	90	3	1,5	T	E	O		PD	Ob
2	FZP1065	Physics 1.6		2				K1ENG_U09 K1ENG_K01 K1ENG_K02 K1ENG_K03 K1ENG_K04	30	60	2	1,5	T	Z	O	P	PD	Ob

[1]BK – liczba punktów ECTS przypisanych godzinom zajęć wymagających bezpośredniego kontaktu nauczycieli i studentów
[2]Tradycyjna – T, zdalna – Z
[3]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)
[4]Kurs/ grupa kursów Ogólnouczelniany – O
[5]Kurs/ grupa kursów Praktyczny – P. W grupie kursów w nawiasie wpisać liczbę punktów ECTS dla kursów o charakterze praktycznym
[6]KO - kształcenia ogólnego, PD – podstawowy, K – kierunkowy, S – specjalnościowy
[7]W - wybieralny, Ob – obowiązkowy

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
3	FZP1066	Physics 2.11	2					K1ENG_W03 K1ENG_K01 K1ENG_K02 K1ENG_K03 K1ENG_K04	30	90	3	1,5	T	E	O		PD	Ob
4	FZP1066	Physics 2.11			2			K1ENG_U09 K1ENG_K01 K1ENG_K02 K1ENG_K03 K1ENG_K04	30	60	2	1,5	T	Z	O	P	PD	Ob
		Total	4	2	2				120	300	10	6						

4.1.2.3. *Chemistry* module

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	CHC1101	Chemistry	2					K1ENG_W04	30	90	3	1,5	T	Z	O		PD	Ob
2	CHC1101	Chemistry			1			K1ENG_U10	15	30	1	0,75	T	Z	O	P	PD	Ob
		Total	2		1				45	120	4	2,25						

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[1]
lec	cl	lab	pr	sem				
13	7	3			345	1020	34	20,25

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[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] 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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN0371	Power Industry Machinery	2					K1ENG_W08	30	60	2	1	T	Z			K	Ob
2	ESN0220	Descriptive Geometry	2					K1ENG_W07	30	60	2	1	T	Z			K	Ob
3	ESN0220	Descriptive Geometry		1				K1ENG_U13	15	30	1	0,75	T	Z		P	K	Ob
4	ESN0780	Basics of Metrology and Experiment Techniques	2					K1ENG_W05	30	60	2	1	T	Z			K	Ob
5	ESN0780	Basics of Metrology and Experiment Techniques		1				K1ENG_U11 K1ENG_U12	15	30	1	0,75	T	Z		P	K	Ob
6	ESN0780	Basics of Metrology and Experiment Techniques			1			K1ENG_U11 K1ENG_U12	15	30	1	0,75	T	Z		P	K	Ob
7	ESN0710	Fundamentals of Materials Science	2					K1ENG_W09	30	90	3	1,5	T	E			K	Ob
8	ESN0760	Fundamentals of Fluid Mechanics	2					K1ENG_W10	30	60	2	1	T	Z			K	Ob
9	ESN0760	Fundamentals of Fluid Mechanics		1				K1ENG_U14	15	30	1	0,75	T	Z		P	K	Ob
10	ESN0800	Basics of Thermodynamics	2					K1ENG_W11	30	60	2	1	T	Z			K	Ob
11	ESN0800	Basics of Thermodynamics		1				K1ENG_U16	15	30	1	0,75	T	Z		P	K	Ob
12	ESN0730	Fundamental Mechanics And Strength of Materials	1					K1ENG_W12	15	30	1	0,5	T	Z			K	Ob
13	ESN0730	Fundamental Mechanics and Strength of Materials		1				K1ENG_U18	15	30	1	0,75	T	Z		P	K	Ob
14	ESN0111	Ecology	2					K1ENG_W19 K1ENG_K02	30	60	2	1	T	Z			K	Ob
15	ESN0460	Mechanics and Strength of Materials	2					K1ENG_W12	30	60	2	1	T	Z			K	Ob
16	ESN0460	Mechanics and Strength of Materials		2				K1ENG_U18	30	60	2	1,5	T	Z		P	K	Ob
17	ESN1040	Combustion and Fuels	2					K1ENG_W18	30	90	3	1,5	T	E			K	Ob
18	ESN1040	Combustion and Fuels		1				K1ENG_U25 K1ENG_U26	15	30	1	0,75	T	Z		P	K	Ob
19	ESN1040	Combustion and Fuels			1			K1ENG_U25 K1ENG_U26	15	30	1	0,75	T	Z		P	K	Ob
20	ESN0420	Engineering Materials and Consumables	1					K1ENG_W17	15	30	1	0,5	T	Z			K	Ob
21	ESN0420	Engineering Materials and Consumables			1			K1ENG_U24	15	30	1	0,75	T	Z		P	K	Ob
22	ESN0940	Technical Drawing				2		K1ENG_U13	30	60	2	1,5	T	Z		P	K	Ob
23	ESN0660	Fundamentals of Electronics	1					K1ENG_W15	15	30	1	0,5	T	Z			K	Ob
24	ESN0660	Fundamentals of Electronics			1			K1ENG_U21	15	30	1	0,75	T	Z		P	K	Ob

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			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
25	ESN0470	Fluid Mechanics	1					K1ENG_W10	15	60	2	1	T	E			K	Ob
26	ESN0470	Fluid Mechanics		1				K1ENG_U14	15	30	1	0,75	T	Z		P	K	Ob
27	ESN0480	Fluid Mechanics -lab.			2			K1ENG_U15	30	60	2	1,5	T	Z		P	K	Ob
28	ESN1190	Thermodynamics	1					K1ENG_W11	15	60	2	1	T	E			K	Ob
29	ESN1190	Thermodynamics		1				K1ENG_U16	15	30	1	0,75	T	Z		P	K	Ob
30	ESN1200	Thermodynamics – lab.			2			K1ENG_U17 K1ENG_K04	30	60	2	1,5	T	Z		P	K	Ob
31	ESN0680	Fundamentals of Electrical Engineering	2					K1ENG_W16	30	60	2	1	T	Z			K	Ob
32	ESN0680	Fundamentals of Electrical Engineering		1				K1ENG_U22	15	30	1	0,75	T	Z		P	K	Ob
33	ESN0680	Fundamentals of Electrical Engineering			1			K1ENG_U23	15	30	1	0,75	T	Z		P	K	Ob
34	ESN0650	Fundamentals of Control Systems	2					K1ENG_W14	30	90	3	1,5	T	E			K	Ob
35	ESN0650	Fundamentals of Control Systems		1				K1ENG_U19	15	30	1	0,75	T	Z		P	K	Ob
36	ESN0650	Fundamentals of Control Systems			2			K1ENG_U20 K1ENG_K04	30	60	2	1,5	T	Z		P	K	Ob
37	ESN0412	Turbomachinery	2					K1ENG_W30	30	90	3	1,5	T	E			S	W
38	ESN0412	Turbomachinery				1		K1ENG_U37 K1ENG_U29	15	30	1	0,75	T	Z		P	S	W
39	ESN0400	Electrical Machines and Devices	2					K1ENG_W20	30	90	3	1,5	T	E			K	Ob
40	ESN0400	Electrical Machines and Devices			1			K1ENG_U27 K1ENG_K01 K1ENG_K04	15	30	1	0,75	T	Z		P	K	Ob
41	ESN0875	Heat Transfer	2					K1ENG_W21	30	60	2	1	T	Z			K	Ob
42	ESN0875	Heat Transfer		2				K1ENG_U28	30	60	2	1,5	T	Z		P	K	Ob
43	ESN0622	Basics of Machine Design I	2					K1ENG_W22	30	60	2	1	T	Z			K	Ob
44	ESN0622	Basics of Machine Design I				1		K1ENG_U30	15	60	2	1,5	T	Z		P	K	Ob
45	ESN0642	Basics of Machine Design II	2					K1ENG_W22	30	90	3	1,5	T	E			K	Ob
46	ESN0642	Basics of Machine Design II				1		K1ENG_U30	15	60	2	1,5	T	Z		P	K	Ob
47	ESN0062	CAD			2			K1ENG_U13	30	60	2	1,5	T	Z		P	K	Ob
48	ESN0331	Utility Boilers	2					K1ENG_W25	30	90	3	1,5	T	E			K	Ob
49	ESN0331	Utility Boilers				1		K1ENG_U33 K1ENG_U29	15	30	1	0,75	T	Z		P	K	Ob
50	ESN0523	Power Engineering Metrology	2					K1ENG_W24	30	90	3	1,5	T	E			K	Ob
51	ESN0523	Power Engineering Metrology			2			K1ENG_U32	30	60	2	1,5	T	Z		P	K	Ob
52	ESN1190	Flue-gases Cleaning Techniques	2					K1ENG_W23	30	60	2	1	T	Z			K	Ob
53	ESN1190	Flue-gases Cleaning Techniques		1				K1ENG_U31	15	30	1	0,75	T	Z		P	K	Ob

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[5]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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[7] Optional – enter W, obligatory – enter Ob

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			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
54	ESN0136	Power and Heat Stations	2					K1ENG_W26	30	90	3	1,5	T	E			K	Ob
55	ESN0136	Power and Heat Stations			1			K1ENG_U34	15	30	1	0,75	T	Z		P	K	Ob
56	ESN0891	Power Distribution	2					K1ENG_W28	30	90	3	1,5	T	E			K	Ob
57	ESN0891	Power Distribution		1				K1ENG_U36	15	30	1	0,75	T	Z		P	K	Ob
58	ESN0041	Research and Testing of Machines and Devices	1					K1ENG_W27	15	30	1	0,5	T	Z			K	Ob
59	ESN0041	Research and Testing of Machines and Devices			1			K1ENG_U35	15	30	1	0,75	T	Z		P	K	Ob
60	ESN0171	Power Engineering and Environmental	1					K1ENG_W29 K1ENG_K02	15	30	1	0,5	T	Z			K	Ob
61	ESN1370	Engineer Diploma Seminar					1	K1ENG_U01 K1ENG_U03 K1ENG_U05 K1ENG_K01 K1ENG_K04	15	30	1	0,75	T	Z		P	K	Ob
		Total	49	16	18	6	1		1350	3120	104	62,75						

4.1.3.2. *Obligatory main-field-of-study* module *(optionally in English)*

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN0761	Fundamentals of Fluid Mechanics	2					K1ENG_W10	30	60	2	1	T	Z			K	Ob
2	ESN0761	Fundamentals of Fluid Mechanics		1				K1ENG_U14	15	30	1	0,75	T	Z		P	K	Ob
3	ESN0471	Fluid Mechanics	1					K1ENG_W10	15	60	2	1	T	E			K	Ob
4	ESN0471	Fluid Mechanics		1				K1ENG_U14	15	30	1	0,75	T	Z		P	K	Ob
5	ESN0801	Basics of Thermodynamics	2					K1ENG_W11	30	60	2	1	T	Z			K	Ob.
6	ESN0801	Basics of Thermodynamics		1				K1ENG_U16	15	30	1	0,75	T	Z		P	K	Ob
7	ESN1191	Thermodynamic	1					K1ENG_W11	15	60	2	1	T	E			K	Ob
8	ESN1191	Thermodynamic		1				K1ENG_U16	15	30	1	0,75	T	Z		P	K	Ob
9	ESN0876	Heat Transfer	2					K1ENG_W21	30	60	2	1	T	Z			K	Ob.
10	ESN0876	Heat Transfer		2				K1ENG_U28	30	60	2	1,5	T	Z		P	K	Ob

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[7] Optional – enter W, obligatory – enter Ob

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK [1] classes			university-wide[4]	practical[5]	kind[6]	type[7]
11	ESN1043	Combustion and Fuels	2					K1ENG_W18	30	90	3	1,5	T	E			K	Ob
12	ESN1043	Combustion and Fuels		1				K1ENG_U25 K1ENG_U26	15	30	1	0,75	T	Z		P	K	Ob
13	ESN1043	Combustion and Fuels			1			K1ENG_U25 K1ENG_U26	15	30	1	0,75	T	Z		P	K	Ob
14	ESN0731	Fundamental Mechanics and Strength of Materials	1					K1ENG_W12	15	30	1	0,5	T	Z			K	Ob
15	ESN0731	Fundamental Mechanics and Strength of materials		1				K1ENG_U18	15	30	1	0,75	T	Z		P	K	Ob
16	ESN0461	Mechanics and Strength of Materials	2					K1ENG_W12	30	90	2	1	T	Z			K	Ob
17	ESN0461	Mechanics and Strength of Materials		2				K1ENG_U18	30	90	2	1,5	T	Z		P	K	Ob
18	ESN0652	Fundamentals of Control Systems	2					K1ENG_W14	30	90	3	1,5	T	E			K	Ob
19	ESN0652	Fundamentals of Control Systems		1				K1ENG_U19	15	30	1	0,75	T	Z		P	K	Ob
20	ESN0661	Fundamentals of Electronics	1					K1ENG_W15	15	30	1	0,5	T	Z			K	Ob
21	ESN0661	Fundamentals of Electronics			1			K1ENG_U21	15	30	1	0,75	T	Z		P	K	Ob
22	ESN0681	Fundamentals of Electrical Engineering	2					K1ENG_W16	30	60	2	1	T	Z			K	Ob
23	ESN0681	Fundamentals of Electrical Engineering		1				K1ENG_U22	15	30	1	0,75	T	Z		P	K	Ob
24	ESN0623	Basics of Machine Design I	2					K1ENG_W22	30	60	2	1	T	Z			K	Ob
25	ESN0623	Basics of Machine Design I				1		K1ENG_U30	15	60	2	1,5	T	Z		P	K	Ob
26	ESN0643	Basics of Machine Design II	2					K1ENG_W22	30	90	3	1,5	T	E			K	Ob
27	ESN0643	Basics of Machine Design II				1		K1ENG_U30	15	60	2	1,5	T	Z		P	K	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[1]
lec	cl	lab	pr	sem				
49	16	18	6	1	1350	3120	104	62,75

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] 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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	HSN100300BK	Humanities	2					K1ENG_W31 K1ENG_K02 K1ENG_K06	30	60	2	1	T	Z	O		KO	W
2	HSN100300BK	Humanities	1					K1ENG_W31 K1ENG_K02 K1ENG_K06	15	60	2	1	T	Z	O		KO	W
3	ZSN100300BK	Management Science	1					K1ENG_W31 K1ENG_K05	15	30	1	0,5	T	Z	O		KO	W
		Total	4						60	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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	JZL100707	Foreign Language B2.1		4				K1ENG_U06	60	60	2	1,5	T	Z	O	P	KO	W
2	JZL100708	Foreign Language B2.2		4				K1ENG_U06	60	90	3	2,25	T	Z	O	P	KO	W
		Total		8					120	150	5	3,75						

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4.2.1.3. *Sporting classes* **module** *(min. 1 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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	WFW000000BK	Sporting Classes		2				K1ENG_K03	30	30	1	1	T	Z	O	P	KO	W
		Total		2					30	30	1	1						

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[1]
lec	cl	lab	pr	sem				
4	10				210	330	11	7,25

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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1		Advanced Design Methods:			2				30	90	3	2,25	T	Z		P	K	W
	ESN0064	CATIA						K1ENG_U13										
	ESN1022	Solid Edge						K1ENG_U13										
	ESN0246	3D Graphic						K1ENG_U13 K1ENG_U05 K1ENG_K06										
		Total			2				30	90	3	2,25						

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4.2.2.2. *Engineer individual student project* **module** *(min. 3 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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN1351	Engineer Individual Student Project				4		K1ENG_U01 K1ENG_U03 K1ENG_U04 K1ENG_K01	60	90	3	1	T	Z		P	K	W
		Total				4			60	90	3	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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN1410	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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN1420	Engineer Thesis						K1ENG_U01 K1ENG_U03 K1ENG_U04 K1ENG_U05 K1ENG_K01 K1ENG_K04 K1ENG_K06		450	15	2	T	Z		P		W
		Total				4				450	15	2						

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] 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[1]
lec	cl	lab	pr	sem				
		2	4		90	750	25	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 **GK**)	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN0850	Pumps and Pumping Systems	2					S1ENC_W01	30	60	2	1	T	Z			S	W
2	ESN0850	Pumps and Pumping Systems		1				S1ENC_U01	15	30	1	0,75	T	Z		P	S	W
3	ESN0310	Energy Conversion	2					S1ENC_W07	30	60	2	1	T	Z			S	W
4	ESN0310	Energy Conversion			1			S1ENC_U08	15	30	1	0,75	T	Z		P	S	W
5	ESN0075	Refrigeration and Cryogenics	2					S1ENC_W03	30	90	3	1,5	T	E			S	W
6	ESN0075	Refrigeration and Cryogenics			2			S1ENC_U04	30	60	2	1,5	T	Z		P	S	W
7	ESN0211	Gas Technologies	1					S1ENC_W05	15	30	1	0,5	T	Z			S	W
8	ESN0211	Gas Technologies		1				S1ENC_U05	15	30	1	0,75	T	Z		P	S	W
9	ESN0834	Heat Pumps and Solar Collectors	1					S1ENC_W06	15	30	1	0,5	T	Z			S	W
10	ESN0834	Heat Pumps and Solar Collectors			1			S1ENC_U06	15	30	1	0,75	T	Z		P	S	W
11	ESN0834	Heat Pumps and Solar Collectors				1		S1ENC_U07	15	30	1	0,75	T	Z		P	S	W
12	ESN0686	Basics of Air-conditioning	1					S1ENC_W04	15	30	1	0,5	T	Z			S	W
13	ESN0686	Basics of Air-conditioning			1			S1ENC_U12	15	30	1	0,75	T	Z		P	S	W
14	ESN0170	Nuclear Power Engineering	2					S1ENC_W02	30	60	2	1	T	Z			S	W
15	ESN0170	Nuclear Power Engineering			1			S1ENC_U02	15	30	1	0,75	T	Z		P	S	W
16	ESN0011	Energy Audit	1					S1ENC_W11	15	30	1	0,5	T	Z			S	W
17	ESN0011	Energy Audit			1			S1ENC_U12	15	30	1	0,75	T	Z		P	S	W
18	ESN0971	Heat Distribution Networks	1					S1ENC_W10	15	30	1	0,5	T	Z			S	W
19	ESN0971	Heat Distribution Networks		1				S1ENC_U11	15	30	1	0,75	T	Z		P	S	W
20	ESN0341	Boilers and Small Power	1					S1ENC_W09	15	30	1	0,5	T	Z			S	W
21	ESN0341	Boilers and Small Power		1				S1ENC_U10	15	30	1	0,75	T	Z		P	S	W
22	ESN0240	Energy Management	2					S1ENC_W08	30	60	2	1	T	Z			S	W
23	ESN0240	Energy Management		1				S1ENC_U09	15	30	1	0,75	T	Z		P	S	W
		Total	16	5	7	1			435	900	30	18,25						

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

4.2.3.2. *Specialization subjects* module (optionally in English)

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[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes[1]			university-wide[4]	practical[5]	kind[6]	type[7]
1	ESN0311	Energy Conversion	2					S1ENC_W07	30	60	2	1	T	Z			S	W
2	ESN0311	Energy Conversion			1			S1ENC_U08	15	30	1	0,75	T	Z		P	S	W
3	ESN0078	Refrigeration and Cryogenics	2					S1ENC_W03	30	90	3	1,5	T	E			S	W
4	ESN0078	Refrigeration and Cryogenics			2			S1ENC_U04	30	60	2	1,5	T	Z		P	S	W

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[1]
lec	cl	lab	pr	sem				
16	5	7	1		435	900	30	18,25

[1]BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[6] KO – general education, PD – basic sciences, K – field-of-studies, S – specialization
[7] Optional – enter W, obligatory – enter Ob

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[1]**	**Training crediting mode**	**Code**
4	0	Opinion from training tutor and a report from practice	ESN1410

Training duration	**Training objective**
4 weeks	- 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 knowlege for solving attributed tasks

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[1] 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[1])
117 ECTS points

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		58
Including laboratory classes and project	30	
Number of ECTS points for optional subjects		44
Including:		
laboratory classes and project	14	
diploma dissertation	15	
Total number of ECTS points		102

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)
51 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 (31,4 %)

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 turbulentne. 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
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. Construction and technological problems

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)

3. Operational problems

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 cieplnego 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

No.	*Course code*	*Name of course*	*Crediting by deadline of... (number of semester)*
Faculty Council Resolution No 4/D/2008 of 19.09.2008		The condition for admission the student to the execution of the *master thesis* 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)