

PROGRAMME OF EDUCATION

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: MECHANICAL ENGINEERING AND MACHINE BUILDING

in area of technical science

EDUCATION LEVEL: 1st level, Engineer

FORM OF STUDIES: part-time

PROFILE: general academic

SPECIALIZATION: **THERMAL ENGINEERING**

LANGUAGE OF STUDY: polish

Content:

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

Faculty Council Resolution of 30.09.2015

In effect since 01.10.2015

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: 2nd level studies</i>	<i>Graduate profile, employability: Has knowledge of engineering and design using computer techniques. Knows a foreign language at the B2 level. It is prepared to work in companies engaged in the production and operation of machinery, design and construction units and other units of the economic, administrative and educational requiring technical and computer science knowledge and information technology. Has the necessary knowledge and skills to perform engineering tasks in factories of power engineering , refrigeration, chemical, food and other, particularly in the field of thermal-flow processes.</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 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	PRZ0330W	Intellectual and Industrial Property Protection	1,2					K1MBM_W16	18	60	2	1	T	Z	O		KO	Ob
		Total	1,2						18	60	2	1						

4.1.1.2. Information Technologies 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 ¹ classes			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN0165	Information Technologies	1,2					K1MBM_W08	18	60	2	1	T	Z	O		KO	Ob
2	MNN0698	Application Packages			0,6			K1MBM_U08	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 ¹
lec	cl	lab	pr	sem				
2,4		0,6			45	150	5	2,75

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

⁵Practical 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 ¹ classes			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MAP009027	Mathematics 1	1,2					K1MBM_W02 K1MBM_K01	18	120	4	2	T	E	O		PD	Ob
2	MAP009027	Mathematics 1		1,2				K1MBM_U02 K1MBM_K01	18	120	4	3	T	Z	O	P	PD	Ob
3	MAP009028	Mathematics 2	1,2					K1MBM_W01 K1MBM_W02 K1MBM_K01	18	120	4	2	T	E	O		PD	Ob
4	MAP009028	Mathematics 2		1,2				K1MBM_U01 K1MBM_U02 K1MBM_K01	18	120	4	3	T	Z	O	P	PD	Ob
5	MAP009029	Mathematics 3	1,8					K1MBM_W01 K1MBM_W02 K1MBM_K01	27	150	5	2,5	T	E	O		PD	Ob
6	MAP009029	Mathematics 3		1,2				K1MBM_U01 K1MBM_U02 K1MBM_K01	18	120	4	3	T	Z	O	P	PD	Ob
Total			4,2	3,6					117	750	25	15,5						

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 ¹ classes			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	FZP009078	Physics 1	1,2					K1MBM_W03	18	120	4	2	T	E	O		PD	Ob
2	FZP009079	Physics 2	1,2					K1MBM_W03	18	120	4	2	T	E	O		PD	Ob
3	FZP009079	Physics 2		1,2				K1MBM_U03	18	60	2	1,5	T	Z	O	P	PD	Ob
4	FZP009080	Physics 3			1,2			K1MBM_U03	18	60	2	1,5	T	Z	O	P	PD	Ob
Total			2,4	1,2	1,2				72	360	12	7						

¹BK – liczba punktów ECTS przypisanych godzinom zajęć wymagających bezpośredniego kontaktu nauczycieli i studentów

²Tradycyjna – T, zdalna – Z

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

⁴Kurs/ grupa kursów Ogólnouczelniany – O

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

⁶KO - kształcenia ogólnego, PD – podstawowy, K – kierunkowy, S – specjalnościowy

⁷W - wybieralny, Ob – obowiązkowy

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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	CHC003080	Chemistry	1,2					K1MBM_W04	18	60	2	1	T	Z	O		PD	Ob
2	CHC003080	Chemistry			0,6			K1MBM_U04	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 ¹
lec	cl	lab	pr	sem				
7,8	4,8	1,8			216	1200	40	24,25

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

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

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

⁷Optional – 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 ¹ classes			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN0415	Theory of Machines	1,2					K1MBM_W13	18	60	2	1	T	Z			K	Ob
2	MNN0255	Descriptive Geometry	1,2					K1MBM_W07	18	60	2	1	T	Z			K	Ob
3	MNN0255	Descriptive Geometry		0,6				K1MBM_U07	9	60	2	1,5	T	Z		P	K	Ob
4	MNN0826	Basics of Metrology and Experiment Techniques	1,2					K1MBM_W10	18	60	2	1	T	Z			K	Ob
5	MNN0826	Basics of Metrology and Experiment Techniques		0,6				K1MBM_U10	9	60	2	1,5	T	Z		P	K	Ob
6	MNN0826	Basics of Metrology and Experiment Techniques			0,6			K1MBM_U10	9	30	1	0,75	T	Z		P	K	Ob
7	MNN0821	Fundamentals of Materials Science	1,2					K1MBM_W06	18	120	4	2	T	E			K	Ob
8	MNN0515	Mechanics 1	0,6					K1MBM_W05	9	60	2	1	T	Z			K	Ob
9	MNN0515	Mechanics 1		0,6				K1MBM_U05	9	60	2	1,5	T	Z		P	K	Ob
10	MNN0855	Basics of Thermodynamics	1,2					K1MBM_W09	18	60	2	1	T	Z			K	Ob
11	MNN0855	Basics of Thermodynamics		0,6				K1MBM_U09	9	60	2	1,5	T	Z		P	K	Ob
12	MNN0835	Fundamentals of Fluid Mechanics	1,2					K1MBM_W09	18	60	2	1	T	Z			K	Ob
13	MNN0835	Fundamentals of Fluid Mechanics		0,6				K1MBM_U09	9	60	2	1,5	T	Z		P	K	Ob
14	MNN0525	Mechanics 2	1,2					K1MBM_W05	18	120	4	2	T	E			K	Ob
15	MNN0525	Mechanics 2		0,6				K1MBM_U05	9	30	1	0,75	T	Z		P	K	Ob
16	MNN0865	Fundamental Strength of Materials	1,2					K1MBM_W05	18	60	2	1	T	Z			K	Ob
17	MNN0865	Fundamental Strength of Materials		0,6				K1MBM_U05	9	60	2	1,5	T	Z		P	K	Ob
18	MNN0465	Materials Science	0,6					K1MBM_W06	9	30	1	0,5	T	Z			K	Ob
19	MNN0465	Materials Science			0,6			K1MBM_U06 K1MBM_K03 K1MBM_K06	9	30	1	0,75	T	Z		P	K	Ob
20	MNN1065	Combustion and Fuels	1,2					K1MBM_W15	18	120	4	2	T	E			K	Ob
21	MNN1065	Combustion and Fuels			0,6			K1MBM_U14	9	30	1	0,75	T	Z		P	K	Ob
22	MNN0815	Fundamentals of Electrical Engineering	1,2					K1MBM_W12	18	60	2	1	T	Z			K	Ob
23	MNN0815	Fundamentals of Electrical Engineering		0,6				K1MBM_U12	9	60	2	1,5	T	Z		P	K	Ob
24	MNN0815	Fundamentals of Electrical Engineering			0,6			K1MBM_U12	9	30	1	0,75	T	Z		P	K	Ob
25	MNN0615	Workshop Metrology	0,6					K1MBM_W11 K1MBM_K01 K1MBM_K03	9	30	1	0,5	T	Z			K	Ob
26	MNN0615	Workshop Metrology			0,6			K1MBM_U11 K1MBM_K01 K1MBM_K03	9	30	1	0,75	T	Z		P	K	Ob

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³Exam – 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)

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

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

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

⁷Optional – 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
27	MNN1145	Production Technics	1,8					K1MBM_W11	27	90	3	1,5	T	Z			K	Ob
28	MNN1145	Production Technics			1,2			K1MBM_U11	18	60	2	1,5	T	Z		P	K	Ob
29	MNN1005	Technical Drawing				1,2		K1MBM_U07	18	120	4	3	T	Z		P	K	Ob
30	MNN0785	Fundamentals of Control Systems	1,2					K1MBM_W12	18	120	4	2	T	E			K	Ob
31	MNN0785	Fundamentals of Control Systems		0,6				K1MBM_U12	9	30	1	0,75	T	Z		P	K	Ob
32	MNN0785	Fundamentals of Control Systems			1,2			K1MBM_U12	18	60	2	1,5	T	Z		P	K	Ob
33	MNN0805	Fundamentals of Electronics	0,6					K1MBM_W12	9	30	1	0,5	T	Z			K	Ob
34	MNN0805	Fundamentals of Electronics			0,6			K1MBM_U12	9	30	1	0,75	T	Z		P	K	Ob
35	MNN0745	Basics of Machine Design I	1,2					K1MBM_W14	18	60	2	1	T	Z			K	Ob
36	MNN0745	Basics of Machine Design I				1,2		K1MBM_U13	18	120	4	3	T	Z		P	K	Ob
37	MNN0755	Basics of Machine Design II	1,2					K1MBM_W14	18	120	4	2	T	E			K	Ob
38	MNN0755	Basics of Machine Design II				1,2		K1MBM_U13	18	120	4	3	T	Z		P	K	Ob
39	MNN0085	CAD I			1,2			K1MBM_U07	18	90	3	1,5	T	Z		P	K	Ob
40	MNN0105	CAD II			1,2			K1MBM_U07	18	90	3	2,25	T	Z		P	K	Ob
41	MNN0115	Ecology	1,2					K1MBM_W17 K1MBM_K02	18	60	2	1	T	Z			K	Ob
42	MNN1655	Environmental Management	1,2					K1MBM_W17 K1MBM_K02	18	30	1	0,5	T	Z			K	Ob
43	MNN1515	Engineer Diploma Seminar					0,6	K1MBM_U16 K1MBM_U17 K1MBM_K01 K1MBM_K03	9	30	1	0,75	T	Z		P	K	Ob
Total			22,2	5,4	8,4	3,6	0,6		603	2760	92	56,5						

Altogether for main-field-of-study modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes ¹
lec	cl	lab	pr	sem				
22,2	5,4	8,4	3,6	0,6	603	2760	92	56,5

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

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

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

⁷Optional – 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 ¹ classes ¹			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	HSN100300BK	Humanities	0,6					K1MBM_W18 K1MBM_K06	9	30	1	0,5	T	Z	O		KO	W
2	HSN100300BK	Humanities	1,2					K1MBM_W18 K1MBM_K06	18	90	3	1,5	T	Z	O		KO	W
3	ZSN100300BK	Management Science	0,6					K1MBM_W18 K1MBM_K06	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 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 ¹			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	JZL100789C JZL100792C JZL100845C	Foreign Language B2.1		2,4				K1MBM_U15	36	60	2	1,5	T	Z	O	P	KO	W
2	JZL100790C JZL100793C JZL100844C	Foreign Language B2.2		2,4				K1MBM_U15	36	90	3	2,25	T	Z	O	P	KO	W
Total				4,8					72	150	5	3,75						

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

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

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

⁷Optional – 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 ¹ classes ¹			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	WFW02000BK	Sporting Classes		0,53				K1MBM_K07	8	8	1	1	T	Z	O	P	KO	W
		Total		0,53					8	8	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				
2,4	5,33				116	308	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 ¹ classes ¹			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1		Advanced Design Methods:			1,2			18	90	3	2,25	T	Z		P	K	W	
	MNN0112	CATIA					K1MBM_U08											
	MNN1046	Solid Edge					K1MBM_U07											
	MNN0267	3D Graphic					K1MBM_U07 K1MBM_K06											
		Total			1,2			18	90	3	2,25							

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

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

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

⁷Optional – 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 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1481	Engineer Individual Student Project				4		K1MBM_U17 K1MBM_K04 K1MBM_K05	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 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1530	Professional Practice						K1MBM_K01 K1MBM_K03 K1MBM_K04 K1MBM_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 ¹ classes			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1545	Engineer Thesis						K1MBM_U17 K1MBM_K04 K1MBM_K05		450	15	2	T	Z		P		W
		Total								450	15	2						

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

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

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

⁷Optional – 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				
		1,2	4		78	780	26	5,25

4.2.3. List of specialization modules

4.2.3.1. Specialization subjects module (min. 59 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1125	Technical Fluid Mechanics	1,2					S1INC_W03	18	120	4	2	T	E			S	W
2	MNN1125	Technical Fluid Mechanics		0,6				S1INC_U03	9	30	1	0,75	T	Z	P		S	W
3	MNN1455	Strength of Materials	1,2					S1INC_W01	18	120	4	2	T	E			S	W
4	MNN1455	Strength of Materials		0,6				S1INC_U01	9	60	2	1,5	T	Z	P		S	W
5	MNN1405	Heat Transfer and Heat Exchangers	1,2					S1INC_W04	18	60	2	1	T	Z			S	W
6	MNN1405	Heat Transfer and Heat Exchangers		0,6				S1INC_U04	9	30	1	0,75	T	Z	P		S	W
7	MNN0135	Refrigeration and Cryogenics	1,2					S1INC_W05	18	120	4	2	T	E			S	W
8	MNN0135	Refrigeration and Cryogenics		0,6				S1INC_U06	9	30	1	0,75	T	Z	P		S	W
9	MNN1205	Theory of Thermal Machines	0,6					S1INC_W02	9	90	3	1,5	T	E			S	W
10	MNN1205	Theory of Thermal Machines		1,2				S1INC_U02	18	90	3	2,25	T	Z	P		S	W
11	MNN1225	Thermodynamics - laboratory			1,2			S1INC_U05 K1MBM_K03	18	90	3	2,25	T	Z	P		S	W
12	MNN0305	Process Engineering and Apparatus	1,2					S1INC_W08	18	120	4	2	T	E			S	W
13	MNN0305	Process Engineering and Apparatus		1,2				S1INC_U09	18	90	3	2,25	T	Z	P		S	W
14	MNN0155	Thermal Fluid-flow Machinery	1,2					S1INC_W06	18	60	2	1	T	Z			S	W
15	MNN0155	Thermal Fluid-flow Machinery		0,6				S1INC_U07	9	60	2	1,5	T	Z	P		S	W
16	MNN0565	Fluid Mechanics - laboratory			1,2			S1INC_U03	18	90	3	2,25	T	Z	P		S	W
17	MNN0875	Pumps	1,2					S1INC_W07	18	60	2	1	T	Z			S	W
18	MNN0875	Pumps		0,6				S1INC_U08	9	30	1	0,75	T	Z	P		S	W
19	MNN1355	Boiler Devices	1,2					S1INC_W10	18	90	3	1,5	T	E			S	W
20	MNN1355	Boiler Devices				1,2		S1INC_U11	18	60	2	1,5	T	Z	P		S	W

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

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

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

⁷Optional – 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			universit y-wide ⁴	practical ⁵	kind ⁶	type ⁷
21	MNN0045	Research and Testing of Machines	1,2					S1INC_W12	18	90	3	1,5	T	E			S	W
22	MNN0045	Research and Testing of Machines			1,2			S1INC_U13	18	30	1	0,75	T	Z		P	S	W
23	MNN1085	Fans and Compressors	0,6					S1INC_W07	9	30	1	0,5	T	Z			S	W
24	MNN1085	Fans and Compressors		0,6				S1INC_U08	9	30	1	0,75	T	Z		P	S	W
25	MNN1375	Air Protection Installations	1,2					S1INC_W11	18	60	2	1	T	Z			S	W
26	MNN1375	Air Protection Installations				0,6		S1INC_U12 K1MBM_K01 K1MBM_K02	9	30	1	0,75	T	Z		P	S	W
27	MNN1035	Heat Power Stations	1,2					S1INC_W13	18	30	1	0,5	T	Z			S	W
28	MNN1035	Heat Power Stations			0,6			S1INC_U14	9	30	1	0,75	T	Z		P	S	W
29	MNN0455	Volumetric Machines	1,2					S1INC_W07	18	30	1	0,5	T	Z			S	W
30	MNN0455	Volumetric Machines		0,6				S1INC_U08	9	30	1	0,75	T	Z		P	S	W
31	MNN0455	Volumetric Machines				0,6		S1INC_U08	9	30	1	0,75	T	Z		P	S	W
32	MNN0985	Nuclear Reactors	0,6					S1INC_W09	9	30	1	0,5	T	Z			S	W
33	MNN0985	Nuclear Reactors			0,6			S1INC_U10	9	30	1	0,75	T	Z		P	S	W
Total			16,2	7,2	4,8	2,4	0		459	1980	66	40,25						

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				
16,2	7,2	4,8	2,4		459	1980	66	40,25

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

²Traditional – enter T, remote – enter Z

³Exam – 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)

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

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

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

⁷Optional – 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	MNN1530
Training duration		Training objective	
4 weeks		<ul style="list-style-type: none"> - 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	MNN1545
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 BK¹)

136,25 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	32	63
Number of ECTS points for optional subjects Including: laboratory classes and project diploma dissertation	20 15	61
Total number of ECTS points		124

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)

56 ECTS points

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

103 ECTS points (43 %)

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. Pomiary 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. 2)