

PROGRAMME OF EDUCATION

FACULTY: OF MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: MECHANICAL ENGINEERING AND MACHINE BUILDING

in area of science Technical Sciences

EDUCATION LEVEL: 1st level, inżynier studies

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 26.09.2012
In effect since 01.10.2012

Edited adjustment 21.08.2015

PROGRAMME OF STUDIES

1. Description

<i>Number of semesters: 7</i>	<i>Number ECTS points necessary to obtain qualifications: 210</i>
<i>Prerequisites (particularly for second-level studies): matriculation examination in the following subjects: mathematics, physics and foreign language.</i>	<i>Upon completion of studies graduate obtains professional degree of: inżynier 1st level qualifications</i>
<i>Possibility of continuing studies: 2nd level of study</i>	<i>Graduate profile, employability: Has knowledge of engineering and design using computer techniques. Knows a foreign language at the B2 level. 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.

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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

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

⁷ Optional – enter W, obligatory – enter Ob

4. List of education modules

4.1. List of obligatory modules

4.1.1 List of general education modules

4.1.1.1 Liberal-managerial subjects module (min. 2. ECTS points):

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	PRZ1153	Intellectual and Industrial Property Protection	1,07					K1MBM_W16	16	60	2	1,00	T	Z	O		KO	Ob
Total			1,07						16	60	2	1,00						

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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN0163	Information Technologies	1,07					K1MBM_W08	16	60	2	1,00	T	Z	O		KO	Ob
2	MNN0699	Application packages			1,07			K1MBM_U08	16	60	2	1,50	T	Z	O	P	KO	Ob
Total			1,07		1,07				32	120	4	2,50						

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⁵Practical 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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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				
2,14		1,07			48	180	6	3,50

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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MAP1076	Matematyka 1	2,13					K1MBM_W01 K1MBM_K01	32	120	4	2,00	T	E	O		PD	Ob
2	MAP1076	Matematyka 1		1,07				K1MBM_U01 K1MBM_K01	16	90	3	2,25	T	Z	O	P	PD	Ob
3	MAP1069	Matematyka 2	2,13					K1MBM_W01 K1MBM_W02 K1MBM_K01	32	120	4	2,00	T	E	O		PD	Ob
4	MAP1069	Matematyka 2		1,07				K1MBM_U01 K1MBM_U02 K1MBM_K01	16	90	3	2,25	T	Z	O	P	PD	Ob
5	MAP1159	Matematyka 3	1,07					K1MBM_W02 K1MBM_K01	16	120	4	2,00	T	E	O		PD	Ob
6	MAP1159	Matematyka 3		1,07				K1MBM_U02 K1MBM_K01	16	60	2	1,50	T	Z	O	P	PD	Ob
Total			5,33	3,21					128	600	20	12						

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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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	FZP2109	Physics 1	2,13					K1MBM_W03	32	120	4	2,00	T	E	O		PD	Ob
2	FZP2107	Physics 2	1,07					K1MBM_W03	16	60	2	1,00	T	E	O		PD	Ob
3	FZP2107	Physicsa 2		0,53				K1MBM_U03	8	30	1	0,75	T	Z	O	P	PD	Ob
4	FZP2114	Physics 3	0,53					K1MBM_W03	8	30	1	0,50	T	Z	O		PD	Ob
5	FZP2114	Physics 3			1,07			K1MBM_U03	16	60	2	1,50	T	Z	O	P	PD	Ob
Total			3,73	0,53	1,07				80	300	10	5,75						

4.1.2.3 Chemistry module

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	CHC3079	Chemistry	1,07					K1MBM_W04	16	90	3	1,50	T	Z	O		PD	Ob
2	CHC3079	Chemistry			0,53			K1MBM_U04	8	30	1	0,75	T	Z	O	P	PD	Ob
Total			1,07		0,53				24	120	4	2,25						

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⁵Practical 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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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				
10,13	3,74	1,6			232	1020	34	20,00

4.1.3 List of main-field-of-study modules

4.1.3.1 Obligatory main-field-of-study modules

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol 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	MNN0411	Theory of machines	1,07					K1MBM_W13	16	60	2	1,00	T	Z			K	Ob
2	MNN0250	Descriptive geometry	1,07					K1MBM_W07	16	60	2	1,00	T	Z			K	Ob
3	MNN0250	Descriptive geometry		0,53				K1MBM_U07	8	30	1	0,75	T	Z		P	K	Ob
4	MNN1001	Technical drawing				1,07		K1MBM_U07	16	90	3	2,25	T	Z		P	K	Ob
5	MNN0825	Basics of metrology and experiment techniques	0,53					K1MBM_W10	8	60	2	1,00	T	Z			K	Ob
6	MNN0825	Basics of metrology and experiment techniques		0,53				K1MBM_U10	8	30	1	0,75	T	Z		P	K	Ob
7	MNN0825	Basics of metrology and experiment techniques			0,53			K1MBM_U10	8	30	1	0,75	T	Z		P	K	Ob
8	MNN0510	Mechanics 1	0,53					K1MBM_W05	8	30	1	0,50	T	Z			K	Ob
9	MNN0510	Mechanics 1		0,53				K1MBM_U05	8	30	1	0,75	T	Z		P	K	Ob
10	MNN0520	Mechanics 2	1,07					K1MBM_W05	16	90	3	1,50	T	E			K	Ob

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11	MNN0520	Mechanics 2		0,53				K1MBM_U05	8	30	1	0,75	T	Z		P	K	Ob
12	MNN0860	Fundamentals of Materials Science	1,60					K1MBM_W06	24	120	4	2,00	T	E			K	Ob
13	MNN0860	Fundamentals of Materials Science			0,53			K1MBM_U06 K1MBM_K03 K1MBM_K06	8	30	1	0,75	T	Z		P	K	Ob
14	MNN0860	Fundamental strength of materials	1,07					K1MBM_W05	16	60	2	1,00	T	Z			K	Ob
15	MNN0860	Fundamental strength of materials		0,53				K1MBM_U05	8	30	1	0,75	T	Z		P	K	Ob
16	MNN1140	Production Technics	1,60					K1MBM_W11	24	90	3	1,50	T	Z			K	Ob
17	MNN1140	Production Technics			1,07			K1MBM_U11	16	60	2	1,50	T	Z		P	K	Ob
18	MNN0610	Workshop metrology	0,53					K1MBM_W11 K1MBM_K01K 1MBM_K03	8	30	1	0,50	T	Z			K	Ob
19	MNN0610	Workshop metrology			0,53			K1MBM_U11 K1MBM_K01K 1MBM_K03	8	30	1	0,75	T	Z		P	K	Ob
20	MNN0830	Fundamentals of fluid mechanics	1,07					K1MBM_W09	16	60	2	1,00	T	Z			K	Ob
21	MNN0830	Fundamentals of fluid mechanics		1,07				K1MBM_U09	16	30	1	0,75	T	Z		P	K	Ob
22	MNN0850	Basics of thermodynamics	1,07					K1MBM_W09	16	60	2	1,00	T	Z			K	Ob.
23	MNN0850	Basics of thermodynamics		1,07				K1MBM_U09	16	30	1	0,75	T	Z		P	K	Ob
24	MNN1060	Combustion and fuels	1,07					K1MBM_W15	16	90	3	1,50	T	E			K	Ob
25	MNN1060	Combustion and fuels			0,53			K1MBM_U14	8	30	1	0,75	T	Z		P	K	Ob
26	MNN0781	Fundamentals of Control Systems	1,07					K1MBM_W12	16	90	3	1,50	T	E			K	Ob
27	MNN0781	Fundamentals of Control Systems		1,07				K1MBM_U12	16	30	1	0,75	T	Z		P	K	Ob
28	MNN0781	Fundamentals of Control Systems			1,07			K1MBM_U12	16	60	2	1,50	T	Z		P	K	Ob
29	MNN0800	Fundamentals of Electronics	0,53					K1MBM_W12	8	30	1	0,50	T	Z			K	Ob
30	MNN0800	Fundamentals of Electronics			0,53			K1MBM_U12	8	30	1	0,75	T	Z		P	K	Ob
31	MNN0810	Electrical Engineering Fundamentals	1,07					K1MBM_W12	16	60	2	1,00	T	Z			K	Ob

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32	MNN0810	Electrical Engineering Fundamentals		0,53				K1MBM_U12	8	30	1	0,75	T	Z		P	K	Ob
33	MNN0810	Electrical Engineering Fundamentals			0,53			K1MBM_U12	8	30	1	0,75	T	Z		P	K	Ob
34	MNN0740	Basics of Machine Design I	1,07					K1MBM_W14	16	60	2	1,00	T	Z			K	Ob
35	MNN0740	Basics of Machine Design I				1,07		K1MBM_U13	16	60	2	1,50	T	Z		P	K	Ob
36	MNN0750	Basics of Machine Design II	1,07					K1MBM_W14	16	90	3	1,50	T	E			K	Ob
37	MNN0750	Basics of Machine Design II				1,07		K1MBM_U13	16	60	2	1,50	T	Z		P	K	Ob
38	MNN0091	CAD I			1,07			K1MBM_U07	16	60	2	1,50	T	Z		P	K	Ob
39	MNN0100	CAD II			1,07			K1MBM_U07	16	60	2	1,50	T	Z		P	K	Ob
40	MNN0190	Ecology	1,07					K1MBM_W17 K1MBM_K02	16	90	3	1,50	T	Z			K	Ob
41	MNN1650	Environmental management	1,07					K1MBM_W17 K1MBM_K02	16	90	3	1,50	T	Z			K	Ob
42	MNN1510	Engineering diploma seminar					1,07	K1MBM_U16 K1MBM_U17 K1MBM_K01 K1MBM_K03	16	30	1	0,75	T	Z		P	K	Ob
Total			19,2	6,39	7,46	3,21	1,07		560	2250	75	45,25						

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 ¹
lec	cl	lab	pr	sem				
19,2	6,39	7,46	3,21	1,07	560	2250	75	45,25

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4.2 List of optional modules

4.2.1 List of general education modules

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

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol 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	HNN100100BK	Humanities	0,53					K1MBM_W18 K1MBM_K06	8	30	1	0,50	T	Z	O		KO	W
2	HNN100100BK	Humanities	1,07					K1MBM_W18 K1MBM_K06	16	60	2	1,00	T	Z	O		KO	W
3	ZNN100100BK	Management science	0,53					K1MBM_W18 K1MBM_K06	8	30	1	0,50	T	Z	O		KO	W
Total			2,13						32	120	4	2,00						

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	JZL100655BK	Foreign language B2.1.1		1,60				K1MBM_U15	24	30	1	0,75	T	Z	O	P	KO	W
2	JZL100655BK	Foreign language B2.1.2		1,60				K1MBM_U15	24	30	1	0,75	T	Z	O	P	KO	W
3	JZL100655BK	Foreign language B2.2		1,60				K1MBM_U15	24	90	3	2,25	T	Z	O	P	KO	W
Total				4,80					72	150	5	3,75						

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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				
2,13	4,80				104	270	9	5,75

4.2.3 List of main-field-of-study modules

4.2.3.1. Advanced desing 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN0111	CATIA			1,07			K1MBM_U07	16	90	3	2,25	T	Z		P	K	W
2	MNN1045	Solid Edge			1,07			K1MBM_U07	16	90	3	2,25	T	Z		P	K	W
3	MNN0266	3D graphic			1,07			K1MBM_U07 K1MBM_K06	16	90	3	2,25	T	Z		P	K	W
Total					3,21				48	270	9	6,75						

4.2.3.2. 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univers ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1481	Engineer individual student project				4,00		K1MBM_U17 K1MBM_K04 K1MBM_K05	60	120	4	1,00	T	Z		P	K	W
Total						4			60	120	4	1,00						

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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

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⁷Optional – enter W, obligatory – enter Ob

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

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class ¹ es			univers- ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MSN1590	Proffecional practice						K1MBM_K01 K1MBM_K03 K1MBM_K04 K1MBM_K05		120	4	0		Z		P	K	W
Total									120	4	0							

4.2.3.4. 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 credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class ¹ es			univers- ity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1540	Engineer thesis						K1MBM_U17 K1MBM_K04 K1MBM_K05		450	15	2,00	T	Z		P	K	W
Total									450	15	2,00							

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				
		1,07	4,00		76	780	26	5,25

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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

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

⁷ Optional – enter W, obligatory – enter Ob

4.2.4 List of specialization modules

4.2.4.1 Specialization subjects (e.g. whole specialization) modules (min. 61 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 cred- it- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es ¹			univer- sity- wide ⁴	practical ⁵	kind ⁶	type ⁷
1	MNN1451	Strength of materials	1,07					S1INC_W01	16	90	3	1,50	T	E			S	W
2	MNN1451	Strength of materials		1,07				S1INC_U01	16	60	2	1,50	T	Z		P	S	W
4	MNN1201	Theory of thermal machines	0,53					S1INC_W02	8	90	3	1,50	T	E			S	W
5	MNN1201	Theory of thermal machines		1,07				S1INC_U02	16	30	1	0,75	T	Z		P	S	W
6	MNN1120	Technical Fluid Mechanics	1,07					S1INC_W03	16	90	3	1,50	T	E			S	W
7	MNN1120	Technical Fluid Mechanics		0,53				S1INC_U03	8	30	1	0,75	T	Z		P	S	W
8	MNN1400	Heat transfer and heat exchangers	1,07					S1INC_W04	16	60	2	1,00	T	Z			S	W
9	MNN1400	Heat transfer and heat exchangers		0,53				S1INC_U04	8	30	1	0,75	T	Z		P	S	W
10	MNN1250	Thermodynamics - lab			1,07	1,07		S1INC_U05 K1MBM_K03	16	60	2	1,50	T	Z		P	S	W
11	MNN0580	Fluid Mechanics - laboratory			1,07			S1INC_U03	16	60	2	1,50	T	Z		P	S	W
12	MNN0130	Refrigeration and Cryogenics	1,07					S1INC_W05	16	90	3	1,50	T	E			S	W
13	MNN0130	Refrigeration and Cryogenics		0,53				S1INC_U06	8	30	1	0,75	T	Z		P	S	W
14	MNN0151	Thermal fluid–flow machinery	1,07					S1INC_W06	16	60	2	1,00	T	Z			S	W
15	MNN0151	Thermal fluid–flow machinery				1,07		S1INC_U07	16	30	1	0,75	T	Z		P	S	W
16	MNN0881	Pumps	1,07					S1INC_W07	16	60	2	1,00	T	Z			S	W
17	MNN0881	Pumps		0,53				S1INC_U08	8	30	1	0,75	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

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18	MNN0302	Process Engineering and Apparatus	1,07					S1INC_W08	16	90	3	1,50	T	E			S	W
19	MNN0302	Process Engineering and Apparatus		1,07				S1INC_U09	16	60	2	1,50	T	Z		P	S	W
20	MNN1082	Fans and compressors	1,07					S1INC_W07	16	60	2	1,00	T	Z			S	W
21	MNN1082	Fans and compressors		0,53				S1INC_U08	8	30	1	0,75	T	Z		P	S	W
22	MNN0982	Nuclear reactors	1,07					S1INC_W09	16	30	1	0,50	T	Z			S	W
23	MNN0982	Nuclear reactors			1,07			S1INC_U10	16	30	1	0,75	T	Z		P	S	W
24	MNN1360	Boiler devices	1,07					S1INC_W10	16	90	3	1,50	T	E			S	W
25	MNN1360	Boiler devices				1,07		S1INC_U11	16	60	2	1,50	T	Z		P	S	W
26	MNN1370	Air protection installations	1,07					S1INC_W11	16	60	2	1,00	T	Z			S	W
27	MNN1370	Air protection installations		0,53				S1INC_U12 K1MBM_K01 K1MBM_K02	8	30	1	0,75	T	Z		P	S	W
28	MNN0042	Research and testing of machines	1,60					S1INC_W12	24	90	3	1,50	T	E			S	W
29	MNN0042	Research and testing of machines		0,53				S1INC_U13	8	30	1	0,75	T	Z		P	S	W
30	MNN0042	Volumetric machines			1,07			S1INC_U13	16	60	2	1,50	T	Z		P	S	W
31	MNN0452	Volumetric machines	1,07					S1INC_W07	16	60	2	1,00	T	Z			S	W
32	MNN0452	Volumetric machines		1,07				S1INC_U08	16	30	1	0,75	T	Z		P	S	W
33	MNN0452	Heat power stations				0,53		S1INC_U08	8	30	1	0,75	T	Z		P	S	W
34	MNN1044	Heat power stations	1,07					S1INC_W13	16	60	2	1,00	T	Z			S	W
Total			16,04	8,52	4,28	2,67			472	1830	61	36,75						

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⁵Practical 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

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				
16,04	8,52	4,28	2,67		472	1830	61	36,75

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

Name of training		Professional training		
Number of ECTS points	Number of ECTS points for BK classes ¹	Training crediting mode		Code
4	0	Opinion of works curator and a report from training		MSN1590
Training duration		Training objective		
4 weeks		familiarize with the methods of operation of equipment and production, also with procedures and methods of work organization, enabling students to confront their knowledge of the practice and its use in solving the tasks attributed to him		

4.4 Diploma dissertation module

Type of diploma dissertation	inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code
1	15	MSN1600
Character of diploma dissertation		
experimental / project.		
Number of BK ¹ ECTS points	2	

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⁵Practical 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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5. Ways of verifying assumed educational effects

Type of classes	Ways of verifying assumed educational effects
lecture	e.g. examination, progress/final test
class	e.g. progress/final test
laboratory	e.g. pretest, report from laboratory
project	e.g. project defence
seminar	e.g. participation in discussion, topic presentation, essay
training	e.g. report from training
diploma dissertation	prepared diploma dissertation

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)

116 ECTS

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

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⁵Practical 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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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	45 25
Number of ECTS points for optional subjects including laboratory classes and project <i>including diploma dissertation</i>	51 18 15
Total number of ECTS points	96

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)

49 ECTS points

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

95 ECTS points

11. Range of diploma dissertation

1. Zagadnienia teoretyczne

- 1.1. Podstawowe równania mechaniki płynów – zasada zachowania masy, pędu i energii.
- 1.2. Równanie Bernoulliego dla płynu doskonałego i jego zastosowanie.
- 1.3. Przepływy laminarne i turbulenty. Rozkłady prędkości przepływu w przewodzie.
- 1.4. Charakterystyka przepływu w pojedynczym przewodzie i szeregowym systemie hydraulicznym. Rozkład energii wzdłuż rurociągu – wykres Ancony
- 1.5. Pierwsza i druga zasada termodynamiki (entropia, zjawiska odwracalne i nieodwracalne).
- 1.6. Przemiany charakterystyczne gazu doskonałego. Równanie stanu gazu. Gaz wilgotny.
- 1.7. Przemiany charakterystyczne pary wodnej (układ p-v, T-s oraz i-s).

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- 1.8. Przewodzenie i przenikanie ciepła. Promieniowanie ciepłe – 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. Zagadnienia konstrukcyjno-technologiczne

- 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 ciepłej - 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. Zagadnienia eksploatacyjne

- 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 ciepłych 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

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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, on September 19, 2008	Student to be admitted to the execution module engineer thesis is to pass all subjects in the curriculum in the semester prior to the semester of graduation.	

13. Plan of studies (attachment no. 2)

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