

# 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

FORM OF STUDIES: full-time

PROFILE: general academic

LANGUAGE OF STUDY: polish

Content:

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

Specialization <b>THERMAL ENGINEERING</b> .....	2
Specjalizacja <b>ENGINEERING OF AVIATION</b> .....	17

Faculty Council Resolution of 26.09.2012

In effect since 01.10.2012

Edited adjustment\_April 2014

**PROGRAMME OF STUDIES – specialization TERMAL ENGINEERING****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 inżynier professional degree of: 1st level qualifications</i>
<i>Possibility of continuing studies: 2<sup>nd</sup> level of study</i>	<i>Graduate profile, employability: Has knowledge of engineering and design using computer techniques. Knows a foreign language at the B2 level. 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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	PRZ1152	Intellectual and Industrial Property Protection	2					K1MBM_W16	30	60	2	1,00	T	Z	O		KO	Ob
		Total	2						30	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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	INN1004	Information Technologies	2					K1MBM_W08	30	60	2	1,00	T	Z	O		KO	Ob
2	INN1003	Application packages			2			K1MBM_U08	30	60	2	1,50	T	Z	O	P	KO	Ob
		Total	2		2				60	120	4	2,50						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for general education modules

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
4		2			90	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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			university- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MAP1142	Mathematical Analysis 1A	2					K1MBM_W02 K1MBM_K01	30	150	5	2,50	T	E	O		PD	Ob
2	MAP1142	Mathematical Analysis 1A		2				K1MBM_U02 K1MBM_K01	30	90	3	2,25	T	Z	O	P	PD	Ob
3	MAP1140	Algebra and Analytic Geometry	2					K1MBM_W01 K1MBM_K01	30	60	2	1,00	T	E	O		PD	Ob
4	MAP1140	Algebra and Analytic Geometry		1				K1MBM_U01 K1MBM_K01	15	60	2	1,50	T	Z	O	P	PD	Ob
5	MAP1144	Mathematical Analysis 2.2 A	3					K1MBM_W02 K1MBM_K01	45	150	5	2,50	T	E	O		PD	Ob
6	MAP1144	Mathematical Analysis 2.2 A		2				K1MBM_U02 K1MBM_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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			university- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	FZP1065	Physics 1.6	2					K1MBM_W03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	90	3	1,50	T	E	O		PD	Ob
2	FZP1065	Physics 1.6		2				K1MBM_W03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	60	2	1,50	T	Z	O	P	PD	Ob
3	FZP1066	Physics 2.11	2					K1MBM_W03 K1MBM_K01	30	90	3	1,50	T	E	O		PD	Ob

								K1MBM_K02 K1MBM_K03 K1MBM_K04										
4	FZP1066	Physics 2.11			2			K1MBM_U03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	60	2	1,50	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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of cred- it- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	CHC1101	Chemistry	2					K1MBM_W04	30	90	3	1,50	T	Z	O		PD	Ob
2	CHC1101	Chemistry			1			K1MBM_U04	15	30	1	0,75	T	Z	O	P	PD	Ob
Total			2		1				45	120	4	2,25						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for basic sciences modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
13	7	3			345	1020	34	20,25

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

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

No	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of credit- ing	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0371	Theory of machines	2					K1MBM_W13	30	60	2	1,00	T	Z			K	Ob
2	MSN0230	Descriptive geometry	2					K1MBM_W07	30	60	2	1,00	T	Z			K	Ob
3	MSN0230	Descriptive geometry		1				K1MBM_U07	15	30	1	0,75	T	Z		P	K	Ob
4	MSN0971	Technical drawing				2		K1MBM_U07	30	90	3	2,25	T	Z		P	K	Ob
5	MSN0815	Basics of metrology and experiment techniques	2					K1MBM_W10	30	60	2	1,00	T	Z			K	Ob
6	MSN0815	Basics of metrology and experiment techniques		1				K1MBM_U10	15	30	1	0,75	T	Z		P	K	Ob
7	MSN0815	Basics of metrology and experiment techniques			1			K1MBM_U10	15	30	1	0,75	T	Z		P	K	Ob
8	MSN0430	Mechanics 1	1		1			K1MBM_W05	15	30	1	0,50	T	Z			K	Ob
9	MSN0430	Mechanics 1		1				K1MBM_U05	15	30	1	0,75	T	Z		P	K	Ob
10	MSN0450	Mechanics 2	2					K1MBM_W05	30	90	3	1,50	T	E			K	Ob
11	MSN0450	Mechanics 2		1				K1MBM_U05	15	30	1	0,75	T	Z		P	K	Ob
12	MSN0770	Fundamentals of Materials Science	2					K1MBM_W06	30	90	3	1,50	T	E			K	Ob
13	MSN0400	Materials Science	1					K1MBM_W06	15	30	1	0,50	T	Z			K	Ob
14	MSN0400	Materials Science			1			K1MBM_U06 K1MBM_K03 K1MBM_K06	15	30	1	0,75	T	Z		P	K	Ob
15	MSN0820	Fundamental strength of materials	2					K1MBM_W05 K1MBM_K02 K1MBM_K04	30	60	2	1,00	T	Z			K	Ob
16	MSN0820	Fundamental strength of materials		1				K1MBM_U05 K1MBM_K02 K1MBM_K04	15	30	1	0,75	T	Z		P	K	Ob
17	MSN1100	Production Technics	3					K1MBM_W11	45	90	3	1,50	T	Z			K	Ob
18	MSN1080	Production Technics			2			K1MBM_U11	30	60	2	1,50	T	Z		P	K	Ob
19	MSN0570	Workshop metrology	1					K1MBM_W11	15	30	1	0,50	T	Z			K	Ob
20	MSN0570	Workshop metrology			1			K1MBM_U11 K1MBM_K01 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
21	MSN0780	Fundamentals of fluid mechanics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
22	MSN0780	Fundamentals of fluid mechanics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
23	MSN0810	Basics of thermodynamics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
24	MSN0810	Basics of thermodynamics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
25	MSN1010	Combustion and fuels	2					K1MBM_W15	30	90	3	1,50	T	E			K	Ob
26	MSN1010	Combustion and fuels			1			K1MBM_U14	15	30	1	0,75	T	Z		P	K	Ob
27	MSN0710	Fundamentals of Control Systems	2					K1MBM_W12	30	90	3	1,50	T	E			K	Ob
28	MSN0710	Fundamentals of Control Systems		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
29	MSN0710	Fundamentals of Control Systems			2			K1MBM_U12	30	60	2	1,50	T	Z		P	K	Ob
30	MSN0740	Fundamentals of Electronics	1					K1MBM_W12	15	30	1	0,50	T	Z			K	Ob
31	MSN0740	Fundamentals of Electronics			1			K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob

32	MSN0750	Fundamentals of Electrical Engineering	2						K1MBM_W12	30	60	2	1,00	T	Z			K	Ob
33	MSN0750	Fundamentals of Electrical Engineering		1					K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
34	MSN0750	Fundamentals of Electrical Engineering			1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
35	MSN0680	Basics of Machine Design I	2						K1MBM_W14	30	60	2	1,00	T	Z			K	Ob
36	MSN0680	Basics of Machine Design I				2			K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob
37	MSN0690	Basics of Machine Design II	2						K1MBM_W14	30	90	3	1,50	T	E			K	Ob
38	MSN0690	Basics of Machine Design II				2			K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob
39	MSN0091	CAD I			2				K1MBM_U07	30	60	2	1,50	T	Z		P	K	Ob
40	MSN0100	CAD II			2				K1MBM_U07	30	60	2	1,50	T	Z		P	K	Ob
41	MSN0210	Ecology	2						K1MBM_W17 K1MBM_K02	30	90	3	1,50	T	Z			K	Ob
42	MSN1500	Environmental management	2						K1MBM_W17 K1MBM_K02	30	90	3	1,50	T	Z			K	Ob
43	MSN1551	Engineer seminar					1		K1MBM_U16 K1MBM_U17 K1MBM_K01 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
Total			37	9	14	6	1			1005	2250	75	45,25						

#### 4.1.3.1 Obligatory main-field-of-study modules (optionally in English)

No	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of cred- iting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univer- sity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0781	Fundamentals of fluid mechanics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
2	MSN0781	Fundamentals of fluid mechanics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
3	MSN0811	Basics of thermodynamics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
4	MSN0811	Basics of thermodynamics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
5	MSN1011	Combustion and fuels	2					K1MBM_W15	30	90	3	1,50	T	E			K	Ob
6	MSN1011	Combustion and fuels			1			K1MBM_U14	15	30	1	0,75	T	Z		P	K	Ob
7	MSN0712	Fundamentals of Control Systems	2					K1MBM_W12	30	90	3	1,50	T	E			K	Ob
8	MSN0712	Fundamentals of Control Systems		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
9	MSN0741	Fundamentals of Electronics	1					K1MBM_W12	15	30	1	0,50	T	Z			K	Ob
10	MSN0741	Fundamentals of Electronics			1			K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
11	MSN0751	Electrical Engineering Fundamentals	2					K1MBM_W12	30	60	2	1,00	T	Z			K	Ob
12	MSN0751	Electrical Engineering Fundamentals		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
13	MSN0681	Basics of Machine Design I	2					K1MBM_W14	30	60	2	1,00	T	Z			K	Ob
14	MSN0681	Basics of Machine Design I				2		K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob
15	MSN0691	Basics of Machine Design II	2					K1MBM_W14	30	90	3	1,50	T	E			K	Ob
16	MSN0691	Basics of Machine Design II				2		K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

<sup>6</sup> KO – general education, PD – basic sciences, K – field-of-studies, S – specialization <sup>7</sup> Optional – enter W, obligatory – enter Ob

**Altogether (for main-field-of-study modules):**

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
37	9	14	6	1	1005	2250	75	45,25

## 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 <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	HSN100100BK	Humanities	2					K1MBM_W18 K1MBM_K06	30	60	2	1,00	T	Z	O		KO	W
2	HSN100100BK	Humanities	1					K1MBM_W18 K1MBM_K06	15	30	1	0,50	T	Z	O		KO	W
3	ZSN100100BK	Management science	1					K1MBM_W18 K1MBM_K06	15	30	1	0,50	T	Z	O		KO	W
Total			4						60	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 <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	JZL100655BK	Foreign language B2.1		4				K1MBM_U15	60	60	2	1,50	T	Z	O	P	KO	W
2	JZL100655BK	Foreign language B2.2		4				K1MBM_U15	60	90	3	2,25	T	Z	O	P	KO	W
Total			4	8					120	150	5	3,75						

#### 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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	WFW000000BK	Sporting classes		2				K1MBM_K07	30	30	1	1,00	T	Z	O	P	KO	W
		Total		2					30	30	1	1,00						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for general education modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
4	10				210	300	10	6,75

## 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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0111	CATIA			2			K1MBM_U08	30	90	3	2,25	T	Z		P	K	W
2	MSN1001	Solid Edge			2			K1MBM_U07	30	90	3	2,25	T	Z		P	K	W
3	MSN0236	3D graphic			2			K1MBM_U07 K1MBM_K06	30	90	3	2,25	T	Z		P	K	W
		Total			6				90	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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1520	Engineer individual student project				4		K1MBM_U17 K1MBM_K04 K1MBM_K05	60	120	4	1,00	T	Z		P	K	W
Total						4			60	120	4	1,00						

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

No	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1590	Professional practice						K1MBM_K01 K1MBM_K03 K1MBM_K04 K1MBM_K05		120	4	0		Z		P	K	W
Total										120	4	0						

**4.2.3.4. Engineering thesis module (min. 15 ECTS points):**

No	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1600	Engineering thesis						K1MBM_U17 K1MBM_K04 K1MBM_K05		450	15	2	T	Z		P	K	W
Total										450	15	2						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

**Altogether for main-field-of-study modules:**

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
		2	4		90	780	26	5,25

**4.2.4 List of specialization modules**

**4.2.4.1 Specialization subjects Thermal Engineering module (min. 59 ECTS points):**

No	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1460	Strength of materials	2					S1INC_W01 K1MBM_K02 K1MBM_K04	30	90	3	1,50	T	E			S	W
2	MSN1460	Strength of materials		1				S1INC_U01 K1MBM_K02 K1MBM_K04	15	30	1	0,75	T	Z		P	S	W
3	MSN1460	Strength of materials			1			S1INC_U01 K1MBM_K02 K1MBM_K04	15	30	1	0,75	T	Z		P	S	W
4	MSN1170	Theory of thermal machines	1					S1INC_W02	15	60	2	1,00	T	E			S	W
5	MSN1170	Theory of thermal machines		2				S1INC_U02	30	60	2	1,50	T	Z		P	S	W
6	MSN1070	Technical Fluid Mechanics	2					S1INC_W03	30	90	3	1,50	T	E			S	W
7	MSN1070	Technical Fluid Mechanics		1				S1INC_U03	15	30	1	0,75	T	Z		P	S	W
8	MSN1400	Heat transfer and heat exchangers	2					S1INC_W04	30	60	2	1,00	T	Z			S	W
9	MSN1400	Heat transfer and heat exchangers		1				S1INC_U04	15	30	1	0,75	T	Z		P	S	W
10	MSN1210	Thermodynamics - lab			2			S1INC_U05	30	60	2	1,50	T	Z		P	S	W
11	MSN0500	Fluid Mechanics - laboratory			2			S1INC_U03	30	60	2	1,50	T	Z		P	S	W
12	MSN0140	Refrigeration and Cryogenics	2					S1INC_W05	30	90	3	1,50	T	E			S	W
13	MSN0140	Refrigeration and Cryogenics		1				S1INC_U06	15	30	1	0,75	T	Z		P	S	W
14	MSN0170	Thermal fluid-flow machinery	2					S1INC_W06	30	60	2	1,00	T	Z			S	W
15	MSN0170	Thermal fluid-flow machinery		1				S1INC_U07	15	30	1	0,75	T	Z		P	S	W
16	MSN0841	Pumps	2					S1INC_W07	30	60	2	1,00	T	Z			S	W
17	MSN0841	Pumps		1				S1INC_U08	15	30	1	0,75	T	Z		P	S	W
18	MSN0262	Process Engineering and Apparatus	2					S1INC_W08	30	90	3	1,50	T	E			S	W
19	MSN0262	Process Engineering and Apparatus		2				S1INC_U09	30	60	2	1,50	T	Z		P	S	W
20	MSN1030	Fans and compressors	1					S1INC_W07	15	30	1	0,50	T	Z			S	W
21	MSN1030	Fans and compressors		1				S1INC_U08	15	30	1	0,75	T	Z		P	S	W

22	MSN0931	Nuclear reactors	1						S1INC_W09	15	30	1	0,50	T	Z			S	W
23	MSN0931	Nuclear reactors			1				S1INC_U10	15	30	1	0,75	T	Z		P	S	W
24	MSN1340	Boiler devices	2						S1INC_W10	30	90	3	1,50	T	E			S	W
25	MSN1340	Boiler devices				2			S1INC_U11	30	60	2	1,50	T	Z		P	S	W
26	MSN1350	Air protection installations	2						S1INC_W11	30	60	2	1,00	T	Z			S	W
27	MSN1350	Air protection installations				1			S1INC_U12 K1MBM_K01 K1MBM_K03	15	30	1	0,75	T	Z		P	S	W
28	MSN0060	Research and testing of machines	2						S1INC_W12	30	90	3	1,50	T	E			S	W
29	MSN0060	Research and testing of machines				2			S1INC_U13	30	60	2	1,50	T	Z		P	S	W
30	MSN0392	Volumetric machines	2						S1INC_W07	30	60	2	1,00	T	Z			S	W
31	MSN0392	Volumetric machines		1					S1INC_U08	15	30	1	0,75	T	Z		P	S	W
32	MSN0392	Volumetric machines				1			S1INC_U08	15	30	1	0,75	T	Z		P	S	W
33	MSN1000	Heat power stations	2						S1INC_W13	30	60	2	1,00	T	Z			S	W
34	MSN1000	Heat power stations				1			S1INC_U14	15	30	1	0,75	T	Z		P	S	W
Total			27	12	9	4				780	1770	59	35,75						

#### 4.2.4.1 Specialization subjects Thermal Engineering 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 <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1071	Technical Fluid Mechanics	2					S1INC_W03	30	90	3	1,50	T	E			S	W
2	MSN1071	Technical Fluid Mechanics		1				S1INC_U03	15	30	1	0,75	T	Z		P	S	W
3	MSN0141	Refrigeration and Cryogenics	2					S1INC_W05	30	90	3	1,50	T	E			S	W
4	MSN0141	Refrigeration and Cryogenics		1				S1INC_U06	15	30	1	0,75	T	Z		P	S	W

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for specialization modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
27	12	9	4		780	1770	59	35,75

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

Name of training	Professional practice		
Number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>	Training crediting mode	Code
4	0	Opinion from training tutor and a report from practice	MSN1590
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 knowledge for solving attributed tasks		

#### 4.4. Diploma dissertation module

Type of diploma dissertation	engineer		
Number of diploma dissertation semesters	Number of ECTS points		Code
1	15		MSN1600
Character of diploma dissertation			
Experimental / design			
Number of BK <sup>1</sup> ECTS points		2	

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

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

**6. Total number of ECTS points, which student has to obtain from classes requiring direct academic teacher-student contact (enter total of ECTS points for courses/groups of courses denoted with code BK<sup>1</sup>)**

**116,75 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

**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	46
Number of ECTS points for optional subjects including laboratory classes and project including engineer thesis	57
Total number of ECTS points	103

**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)**

**50 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).
- 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. 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 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. 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 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 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)**



**PROGRAMME OF STUDIES – specialization ENGINEERING OF AVIATION****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):</i> matriculation examination in the following subjects: mathematics, physics and foreign language.	<i>Upon completion of studies graduate obtains professional degree of: engineer 1st level qualifications</i>
<i>Possibility of continuing studies:</i> 2 <sup>nd</sup> level of study	<i>Graduate profile, employability:</i> 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>Indicate connection with University's mission and its development strategy:</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.

**2. Fields of science and scientific disciplines to which educational effects apply:Technical Sciences****3. Concise analysis of consistency between assumed educational effects and labour 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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	PRZ1152	Intellectual and Industrial Property Protection	2					K1MBM_W16	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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	INN1004	Information Technologies	2					K1MBM_W08	30	60	2	1	T	Z	O		KO	Ob
2	INN1003	Application packages			2			K1MBM_U08	30	60	2	1,5	T	Z	O	P	KO	Ob
Total			2		2				60	120	4	2,5						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for general education modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
4		2			90	180	6	3,5

## 4.1.2 List of basic sciences modules

### 4.1.2.1 Mathematics module

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MAP1142	Mathematical analysis 1.1A	2					K1MBM_W02 K1MBM_K01	30	150	5	2,5	T	E	O		PD	Ob
2	MAP1142	Mathematical analysis 1.1A		2				K1MBM_U02 K1MBM_K01	30	90	3	2,25	T	Z	O	P	PD	Ob
3	MAP1140	Algebra and analytic geometry	2					K1MBM_W01 K1MBM_K01	30	60	2	1	T	E	O		PD	Ob
4	MAP1140	Algebra and analytic geometry		1				K1MBM_U01 K1MBM_K01	15	60	2	1,5	T	Z	O	P	PD	Ob
5	MAP1144	Mathematical analysis 2.2A	3					K1MBM_W02 K1MBM_K01	45	150	5	2,5	T	E	O		PD	Ob
6	MAP1144	Mathematical analysis 2.2A		2				K1MBM_U02 K1MBM_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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	FZP1065	Physics 1.6	2					K1MBM_W03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	90	3	1,5	T	E	O		PD	Ob
2	FZP1065	Physics 1.6		2				K1MBM_U03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	60	2	1,5	T	Z	O	P	PD	Ob
3	FZP1066	Physics 2.11	2					K1MBM_W03 K1MBM_K01 K1MBM_K02 K1MBM_K03 K1MBM_K04	30	90	3	1,5	T	E	O		PD	Ob
4	FZP1066	Physics 2.11			2			K1MBM_U03 K1MBM_K01 K1MBM_K02	30	60	2	1,5	T	Z	O	P	PD	Ob

							K1MBM_K03 K1MBM_K04										
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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	CHC1101	Chemistry	2					K1MBM_W04	30	90	3	1,5	T	Z	O		PD	Ob
2	CHC1101	Chemistry			1			K1MBM_U04	15	30	1	0,75	T	Z	O	P	PD	Ob
Total			2		1				45	120	4	2,25						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

### Altogether for basic sciences modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
13	7	3			345	1020	34	20,25

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

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

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0371	Theory of machines	2					K1MBM_W13	30	60	2	1	T	Z			K	Ob
2	MSN0230	Descriptive geometry	2					K1MBM_W07	30	60	2	1	T	Z			K	Ob
3	MSN0230	Descriptive geometry		1				K1MBM_U07	15	30	1	0,75	T	Z		P	K	Ob
4	MSN0971	Technical drawing				2		K1MBM_U07	30	90	3	2,25	T	Z		P	K	Ob
5	MSN0815	Basics of metrology and experiment techniques	2					K1MBM_W10	30	60	2	1	T	Z			K	Ob
6	MSN0815	Basics of metrology and experiment techniques		1				K1MBM_U10	15	30	1	0,75	T	Z		P	K	Ob

7	MSN0815	Basics of metrology and experiment techniques			1			K1MBM_U10	15	30	1	0,75	T	Z		P	K	Ob
8	MSN0430	Mechanics 1	1					K1MBM_W05	15	30	1	0,5	T	Z			K	Ob
9	MSN0430	Mechanics 1		1				K1MBM_U05	15	30	1	0,75	T	Z		P	K	Ob
10	MSN0450	Mechanics 2	2					K1MBM_W05	30	90	3	1,5	T	E			K	Ob
11	MSN0450	Mechanics 2		1				K1MBM_U05	15	30	1	0,75	T	Z		P	K	Ob
12	MSN0770	Fundamentals of Materials Science	2					K1MBM_W06	30	90	3	1,5	T	E			K	Ob
13	MSN0400	Materials Science	1					K1MBM_W06	15	30	1	0,5	T	Z			K	Ob
14	MSN0400	Materials Science			1			K1MBM_U06 K1MBM_K03 K1MBM_K06	15	30	1	0,75	T	Z		P	K	Ob
15	MSN0820	Fundamental strength of materials	2					K1MBM_W05 K1MBM_K02 K1MBM_K04	30	60	2	1	T	Z			K	Ob
16	MSN0820	Fundamental strength of materials		1				K1MBM_U05 K1MBM_K02 K1MBM_K04	15	30	1	0,75	T	Z		P	K	Ob
17	MSN1100	Production Technics	3					K1MBM_W11	45	90	3	1,5	T	Z			K	Ob
18	MSN1100	Production Technics			2			K1MBM_U11	30	60	2	1,5	T	Z		P	K	Ob
19	MSN0570	Workshop metrology	1					K1MBM_W11 K1MBM_K01 K1MBM_K03	15	30	1	0,5	T	Z			K	Ob
20	MSN0570	Workshop metrology			1			K1MBM_U11 K1MBM_K01 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
21	MSN0780	Fundamentals of fluid mechanics	2					K1MBM_W09	30	60	2	1	T	Z			K	Ob
22	MSN0780	Fundamentals of fluid mechanics		1				K1MBM_U09 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
23	MSN0810	Basics of thermodynamics	2					K1MBM_W09	30	60	2	1	T	Z			K	Ob
24	MSN0810	Basics of thermodynamics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
25	MSN1010	Combustion and fuels	2					K1MBM_W15	30	90	3	1,5	T	E			K	Ob
26	MSN1010	Combustion and fuels			1			K1MBM_U14	15	30	1	0,75	T	Z		P	K	Ob
27	MSN0710	Fundamentals of Control Systems	2					K1MBM_W12	30	90	3	1,5	T	E			K	Ob
28	MSN0710	Fundamentals of Control Systems		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
29	MSN0710	Fundamentals of Control Systems			2			K1MBM_U12	30	60	2	1,5	T	Z		P	K	Ob
30	MSN0740	Fundamentals of Electronics	1					K1MBM_W12	15	30	1	0,5	T	Z			K	Ob
31	MSN0740	Fundamentals of Electronics			1			K1MBM_U12 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
32	MSN0750	Electrical Engineering Fundamentals	2					K1MBM_W12	30	60	2	1	T	Z			K	Ob
33	MSN0750	Electrical Engineering Fundamentals		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
34	MSN0750	Electrical Engineering Fundamentals			1			K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob

35	MSN0680	Basics of Machine Design I	2					K1MBM_W14	30	60	2	1	T	Z			K	Ob
36	MSN0680	Basics of Machine Design I				2		K1MBM_U13	30	60	2	1,5	T	Z		P	K	Ob
37	MSN0690	Basics of Machine Design II	2					K1MBM_W14	30	90	3	1,5	T	E			K	Ob
38	MSN0690	Basics of Machine Design II				2		K1MBM_U13	30	60	2	1,5	T	Z		P	K	Ob
39	MSN0091	CAD I			2			K1MBM_U07	30	60	2	1,5	T	Z		P	K	Ob
40	MSN0100	CAD II			2			K1MBM_U07	30	60	2	1,5	T	Z		P	K	Ob
41	MSN0210	Ecology	2					K1MBM_W17 K1MBM_K02	30	90	3	1,5	T	Z			K	Ob
42	MSN1500	Environmental management	2					K1MBM_W17 K1MBM_K02	30	90	3	1,5	T	Z			K	Ob
43	MSN1551	Diploma seminar					1	K1MBM_U16 K1MBM_U17 K1MBM_K01 K1MBM_K03	15	30	1	0,75	T	Z		P	K	Ob
Total			37	9	14	6	1		1005	2250	75	45,25						

#### 4.1.3.1 Obligatory main-field-of-study modules (optionally in English)

No	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/ group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK class es <sup>1</sup>			univers ity- wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0781	Fundamentals of fluid mechanics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
2	MSN0781	Fundamentals of fluid mechanics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
3	MSN0811	Basics of thermodynamics	2					K1MBM_W09	30	60	2	1,00	T	Z			K	Ob
4	MSN0811	Basics of thermodynamics		1				K1MBM_U09	15	30	1	0,75	T	Z		P	K	Ob
5	MSN1011	Combustion and fuels	2					K1MBM_W15	30	90	3	1,50	T	E			K	Ob
6	MSN1011	Combustion and fuels			1			K1MBM_U14	15	30	1	0,75	T	Z		P	K	Ob
7	MSN0712	Fundamentals of Control Systems	2					K1MBM_W12	30	90	3	1,50	T	E			K	Ob
8	MSN0712	Fundamentals of Control Systems		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
9	MSN0741	Fundamentals of Electronics	1					K1MBM_W12	15	30	1	0,50	T	Z			K	Ob
10	MSN0741	Fundamentals of Electronics			1			K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
11	MSN0751	Electrical Engineering Fundamentals	2					K1MBM_W12	30	60	2	1,00	T	Z			K	Ob
12	MSN0751	Electrical Engineering Fundamentals		1				K1MBM_U12	15	30	1	0,75	T	Z		P	K	Ob
13	MSN0681	Basics of Machine Design I	2					K1MBM_W14	30	60	2	1,00	T	Z			K	Ob
14	MSN0681	Basics of Machine Design I				2		K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob
15	MSN0691	Basics of Machine Design II	2					K1MBM_W14	30	90	3	1,50	T	E			K	Ob
16	MSN0691	Basics of Machine Design II				2		K1MBM_U13	30	60	2	1,50	T	Z		P	K	Ob

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

### Altogether for main-field-of-study modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
37	9	14	6	1	1005	2250	75	45,25

## 4.2 List of optional modules

### 4.2.1 List of general education modules

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

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	HSN100100BK	Humanities course	2					K1MBM_W18 K1MBM_K06	30	60	2	1	T	Z	O		KO	W
2	HSN100100BK	Humanities course	1					K1MBM_W18 K1MBM_K06	15	30	1	0,5	T	Z	O		KO	W
3	ZSN100100BK	Management course	1					K1MBM_W18	15	30	1	0,5	T	Z	O		KO	W
Total			4						60	120	4	2						

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

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	JZL100707BK	Foreign language B2.1		4				K1MBM_U15	60	60	2	1,5	T	Z	O	P	KO	W
2	JZL100708BK	Foreign language B2.2		4				K1MBM_U15	60	90	3	2,25	T	Z	O	P	KO	W
Total				8					120	150	5	3,75						

### 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 <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	WFW00000BK	Sporting classes		2				K1MBM_K07	30	30	1	1	T	Z	O	P	KO	W
		Total		2					30	30	1	1						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

### Altogether for general education modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
4	10				210	300	10	6,75

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

### 4.2.2.1 Advanced design methods module (min. 3 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN0111	CATIA			2			K1MBM_U07	30	90	3	2,25	T	Z		P	K	W
2	MSN1001	Solid Edge			2			K1MBM_U07	30	90	3	2,25	T	Z		P	K	W
3	MSN0236	3D graphic			2			K1MBM_U07 K1MBM_K06	30	90	3	2,25	T	Z		P	K	W
		Total			6				90	270	9	6,75						



#### 4.2.2.2 Engineering individual project module (min. 4 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1520	Engineering individual 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 training module (min. 4 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1590	Professional training						K1MBM_K01 K1MBM_K03 K1MBM_K04 K1MBM_K05	0	120	4	0	T	Z		P	K	W
Total									0	120	4	0						

#### 4.2.2.4 Diploma disertation module (min. 15 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1600	Diploma disertation						K1MBM_U17 K1MBM_K01 K1MBM_K04 K1MBM_K05	0	450	15	2	T	Z		P	K	W
Total									0	450	15	2						

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for main-field-of-study modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
		2	4		90	780	26	5,25

## 4.2.3 List of specialization modules

### 4.2.4.1 Engineering of aviation modules (min. 59 ECTS points):

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			university-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	MSN1430	Strength of aircraft structures	2					S1ILO_W01	30	90	3	1,5	T	E			S	W
2	MSN1430	Strength of aircraft structures		2				S1ILO_U01	30	60	2	1,5	T	Z		P	S	W
3	MSN1190	Theory of aircraft propulsion	2					S1ILO_W02	30	90	3	1,5	T	E			S	W
4	MSN1190	Theory of aircraft propulsion		1				S1ILO_U02	15	30	1	0,75	T	Z		P	S	W
5	MSN0020	Aerodynamics	2					S1ILO_W03	30	90	3	1,5	T	E			S	W
6	MSN0020	Aerodynamics		1				S1ILO_U03	15	30	1	0,75	T	Z		P	S	W
7	MSN0020	Aerodynamics			1			S1ILO_U04	15	30	1	0,75	T	Z		P	S	W
8	MSN0360	Aviation machines and electric devices	2					S1ILO_W04	30	60	2	1	T	Z			S	W
9	MSN0900	Designing of aeroplanes	2					S1ILO_W05	30	60	2	1	T	Z			S	W
10	MSN0900	Designing of aeroplanes				2		S1ILO_U05	30	60	2	1,5	T	Z		P	S	W
11	MSN1250	Aero-piston engines	2					S1ILO_W06	30	90	3	1,5	T	E			S	W
12	MSN1250	Aero-piston engines		1				S1ILO_U06	15	30	1	0,75	T	Z		P	S	W
13	MSN0051	Avionics and control of aircrafts	1					S1ILO_W07	15	30	1	0,5	T	Z			S	W
14	MSN0051	Avionics and control of aircrafts			1			S1ILO_U08	15	30	1	0,75	T	Z		P	S	W
15	MSN0051	Avionics and control of aircrafts				2		S1ILO_U07	30	60	2	1,5	T	Z		P	S	W
16	MSN0481	Flight mechanics	1					S1ILO_W08	15	60	2	1	T	E			S	W
17	MSN0481	Flight mechanics		1				S1ILO_U09	15	30	1	0,75	T	Z		P	S	W
18	MSN0481	Flight mechanics				1		S1ILO_U10	15	30	1	0,75	T	Z		P	S	W
19	MSN1420	Equipment of aircrafts	2					S1ILO_W09	30	60	2	1	T	Z			S	W
20	MSN1420	Equipment of aircrafts			2			S1ILO_U11	30	60	2	1,5	T	Z		P	S	W
21	MSN0321	Constructing of aeroplanes	1					S1ILO_W10	15	60	2	1	T	E			S	W
22	MSN0321	Constructing of aeroplanes		1				S1ILO_U12	15	30	1	0,75	T	Z		P	S	W
23	MSN0321	Constructing of aeroplanes				2		S1ILO_U13	30	60	2	1,5	T	Z		P	S	W
24	MSN1300	Gas turbine engines	2					S1ILO_W11	30	90	3	1,5	T	E			S	W
25	MSN1300	Gas turbine engines		1				S1ILO_U14	15	30	1	0,75	T	Z		P	S	W
26	MSN0190	Diagnostics of aviation equipment	2					S1ILO_W12	30	60	2	1	T	Z			S	W
27	MSN0190	Diagnostics of aviation equipment			2			S1ILO_U15	30	60	2	1,5	T	Z		P	S	W
28	MSN1131	Technology of development and repair	1					S1ILO_W13	15	30	1	0,5	T	Z			S	W
29	MSN1131	Technology of development and repair			1			S1ILO_U16	15	30	1	0,75	T	Z		P	S	W
30	MSN1061	Helicopters	1					S1ILO_W14	15	30	1	0,5	T	Z			S	W

31	MSN0732	Bases of aircraft operation	2				S1ILO_W15	30	60	2	1	T	Z			S	W
32	MSN0732	Bases of aircraft operation		1			S1ILO_U17	15	30	1	0,75	T	Z		P	S	W
33	MSN0732	Bases of aircraft operation				1	S1ILO_U18	15	30	1	0,75	T	Z		P	S	W
34	MSN0188	Human factors in aircraft maintenance	1				S1ILO_W16	15	30	1	0,5	T	Z			S	W
35	MSN0188	Human factors in aircraft maintenance				2	S1ILO_U19	30	60	2	1,5	T	Z		P	S	W
Total			26	8	8	7	3		780	1770	59	36					

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

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

<sup>3</sup>Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

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

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

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

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

#### Altogether for specialization modules:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Number of ECTS points for BK classes <sup>1</sup>
lec	cl	lab	pr	sem				
26	8	8	7	3	780	1770	59	36

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

<b>Name of training</b>		<b>Professional training</b>		
<b>Number of ECTS points</b>	<b>Number of ECTS points for BK classes<sup>1</sup></b>	<b>Training crediting mode</b>		<b>Code</b>
<b>4</b>	<b>0</b>	<b>Opinion of works curator and a report from training</b>		<b>MSN1590</b>
<b>Training duration</b>		<b>Training objective</b>		
<b>4 weeks</b>		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
<b>Character of diploma dissertation</b>		
experimental / project.		
Number of BK <sup>1</sup> ECTS points	2	

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

Type of classes	Ways of verifying assumed educational effects
lecture	examination, final test
class	progress, final test, assessment tasks
laboratory	pretest, report from laboratory
project	project defence
seminar	participation in discussion, topic presentation, essay
training	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 BK<sup>1</sup>):

**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 including laboratory classes and project	23	46
Number of ECTS points for optional subjects including laboratory classes and project	22	58
	15	
Total number of ECTS points		104

**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):

**50 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 exam**

### **1. Theoretical issues**

- 1.1. The basic equations of fluid mechanics - the law of conservation of mass, momentum and energy.
- 1.2. Characteristics of external loads airframe.
- 1.3. Strength characteristics of thin-walled shells.
- 1.4. Bernoulli equation. Critical parameters of gas.
- 1.5. The boundary layer, the flow of gas.
- 1.6. The aerodynamic forces acting on the plane and the factors affecting them.
- 1.7. Excellence aerodynamic and factors affecting its size.
- 1.8. The first and second laws of thermodynamics (entropy, reversible and irreversible phenomena).
- 1.9. Interpretation of the equations of motion of the aircraft are flown fixed.
- 1.10. The stability and controllability of the airplane.
- 1.11. Comparator circuit and the actual piston engine.

- 1.12. Comparator circuit and the actual turbine engine cycle parameters.
- 1.13. Changing the parameters jet engine flow along the channel.
- 1.14. Operation of the flow engine combustion chambers (stoichiometric combustion processes in the combustion chamber, the stream of primary and secondary).
- 1.15. Material properties used in the construction of airframes and engines.

## **2. Design and technological issues**

- 2.1. Systems design aircraft piston engines.
- 2.2. Integrated air turbine design.
- 2.3. Purpose and design of pneumatic systems of aircraft.
- 2.4. Purpose and design of hydraulic systems of aircraft.
- 2.5. The construction of the control plane.
- 2.6. The structural airframe fuel systems.
- 2.7. Preparation of the integral structure and sandwich.
- 2.8. Types of connection elements and airframe components
- 2.9. Mechanization wings - the types and impact on the aerodynamic characteristics
- 2.10. The design of the transmission and control of the helicopter.
- 2.11. Aircraft engine lubrication systems.
- 2.12. Airline Pilot devices - the purpose and principle of operation.
- 2.13. Characteristics flight instrument systems and installation of the engine of the aircraft.
- 2.14. On-board power supply on aircraft.
- 2.15. Aircraft navigation systems.

## **3. Operational issues**

- 3.1. Non-destructive testing methods and their visual characteristics.
- 3.2. Characteristics and moving coil eddy current non-destructive testing methods.
- 3.3. Characterize the concept of diagnosis: diagnosis, prognosis, genezowanie.
- 3.4. Test drive unit SP - target performance and safety.
- 3.5. Ways to prevent unstable operation of the compressor turbine jet engine.
- 3.6. Rules and pedestrian traffic around the airport.
- 3.7. Safety in supplying aircraft fuel.
- 3.8. Safety rules for the operation of electrical and electronic SP.
- 3.9. Air traffic control units and flight insurance.

- 3.10. Methods for maintenance of aircraft - their advantages and disadvantages.
- 3.11. Rules for implementing maintenance of aircraft.
- 3.12. Leveling of the aircraft - the purpose and methodology of the exercise.
- 3.13. Limitations volatile aircraft.
- 3.14. SHEL model structure and the relationships between its elements.
- 3.15. Factors affecting the human capacity.

**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>
1	Faculty Council Resolution no. 4/D/2008, on September 19, 2008	Student to be admitted to the execution module 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)**