

## PLAN OF STUDY

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: MECHANICAL ENGINEERING AND MACHINE BUILDING

EDUCATION LEVEL: 2nd level, Master of Science

FORM OF STUDIES: full-time

PROFILE: general academic

SPECIALIZATION: **REFRIGERATION AND CRYOGENICS**

LANGUAGE OF STUDY: english

Faculty Council Resolution of 30.09.2015  
In effect since 01.10.2015

## Plan of studies structure in point layout

30		<b>Master Individual Student Project</b>	
28			<b>Master Thesis</b>
26			
24			
22			
20			
18			
16			
14			
12			
10			<b>Master Seminar</b>
8		<b>Modelling and Optimisation</b>	
6			<b>Marketing and Management</b>
4	<b>Mechanics</b>	<b>Humanities</b>	
2	<b>Analytical</b>	<b>Foreign Language</b>	<b>Management course</b>
	<b>Foreign Language</b>		<b>Sporting classes</b>
	sem.1	sem.2	sem.3

Legend

Basic and obligatory courses
General and obligatory courses
General and optional courses
Field-of-studies and obligatory courses
Field-of-studies and optional courses
Specialization and optional courses

# 1. Set of obligatory and optional courses and groups of courses in semestral arrangement

## Semester 1

### Obligatory courses number of ECTS points 10

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	MSN0463	Mechanics Analytical	2					K2MBM_W03	30	60	2	1	T	Z			K	Ob
2	MSN1362	Modern Engineering Materials	1					K2MBM_W02	15	30	1	0.5	T	Z			K	Ob
3	MSN1362	Modern Engineering Materials			1			K2MBM_U02	15	30	1	0.75	T	Z		P	K	Ob
4	MSN1362	Modern Engineering Materials				1		K2MBM_U06	15	30	1	0.75	T	Z		P	K	Ob
5	MSN0531	Mechatronics and Control Systems	2					K2MBM_W01	30	90	3	1.5	T	E			K	Ob
6	MSN0531	Mechatronics and Control Systems			2			K2MBM_U01	30	60	2	1.5	T	Z		P	K	Ob
Total			5		3		1		135	300	10	6						

### Optional courses (minimum 300 hours in semester) number of ECTS points 20

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 (continuation), level B+		1				K2MBM_U08	15	30	1	0.75	T	Z	O	P	KO	W
2	MSN1225	Thermodynamic Fundamentals of Refrigeration, Cryogenics and Low Temperature Physics	2					S2RAC_W01	30	60	2	1	T	Z			S	W
3	MSN1225	Thermodynamic Fundamentals of Refrigeration, Cryogenics and Low Temperature Physics				1		S2RAC_U01	15	30	1	0.75	T	Z		P	S	W
4	MSN0161	Compressor Refrigeration Systems	2					S2RAC_W02	30	60	2	1	T	E			S	W
5	MSN0161	Compressor Refrigeration Systems		2				S2RAC_U02	30	60	2	1.5	T	Z		P	S	W
6	MSN0161	Compressor Refrigeration Systems			2			S2RAC_U03	30	60	2	1.5	T	Z		P	S	W
7	MSN0183	Refrigerants and Coolants	1					S2RAC_W03	15	30	1	0.5	T	Z			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

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>
8	MSN0831	Heat Pumps	1					S2RAC_W04	15	30	1	0.5	T	Z			S	W
9	MSN0831	Heat Pumps				1		S2RAC_U04	15	30	1	0.75	T	Z		P	S	W
10	MSN1051	Air-condition Systems	1					S2RAC_W05	15	30	1	0.5	T	Z			S	W
11	MSN0341	Cryogenics	2					S2RAC_W06	30	60	2	1	T	E			S	W
12	MSN0341	Cryogenics		1				S2RAC_U05	15	30	1	0.75	T	Z		P	S	W
13	MSN0341	Cryogenics			2			S2RAC_U06	30	60	2	1.5	T	Z		P	S	W
14	MSN0342	Cryogenic Materials and Fluids	1					S2RAC_W07	15	30	1	0.5	T	Z			S	W
Total			10	4	4	1	1		300	600	20	12.5						

### Altogether in semester 1

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				
15	4	7	1	2	435	900	30	18.5

### Semester 2

#### Obligatory courses number of ECTS points 7

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	MSN0617	Modelling and Optimisation	1					K2MBM_W04	15	60	2	1	T	E			PD	Ob
2	MSN0617	Modelling and Optimisation		2				K2MBM_U03	30	60	2	1.5	T	Z		P	PD	Ob
3	MSN1493	Integrated Production Systems	2					K2MBM_W06	30	60	2	1	T	Z			K	Ob
4	MSN1493	Integrated Production Systems			1			K2MBM_U05	15	30	1	0.75	T	Z		P	K	Ob
Total			3	2	1				90	150	7	4.25						

<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

### Optional courses (minimum 330 hours in semester) number of ECTS points 23

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	JZL100710BK	Foreign Language (second), any level		3				K2MBM_U09	45	60	2	1.5	T	Z	O	P	KO	W
2	HSN100500BK	Humanities Course	1					K2MBM_W07 K2MBM_K02	15	60	2	1	T	Z	O		KO	W
3	MSN1041	Cooling Systems and Refrigeration Plants	1					S2RAC_W08	15	30	1	0.5	T	Z			S	W
4	MSN1041	Cooling Systems and Refrigeration Plants				2		S2RAC_U07	30	60	2	1.5	T	Z		P	S	W
5	MSN0121	Absorption Refrigeration	2					S2RAC_W09	30	60	2	1	T	E			S	W
6	MSN0121	Absorption Refrigeration		1				S2RAC_U08	15	30	1	0.75	T	Z		P	S	W
7	MSN0121	Absorption Refrigeration				1		S2RAC_U09	15	30	1	0.75	T	Z		P	S	W
8	MSN1151	Gas and Cryogenic Technologies	2					S2RAC_W10	30	60	2	1	T	Z			S	W
9	MSN1151	Gas and Cryogenic Technologies				2		S2RAC_U10	30	60	2	1.5	T	Z		P	S	W
10	MSN0035	Applied Superconductivity	1					S2RAC_W11	15	30	1	0.5	T	Z			S	W
11	MSN0343	Cryogenic Systems	1					S2RAC_W12	15	30	1	0.5	T	Z			S	W
12	MSN0245	Introduction to Numerical Flow Phenomena Analysis			1			S2RAC_U11	15	30	1	0.75	T	Z		P	S	W
13	MSN1535	Master Individual Student Project				4		K2MBM_U07 K2MBM_K01 K2MBM_K04 K2MBM_K05	60	150	5	1	T	Z		P	K	W
Total			8	4	1	9			330	690	23	12.25						

### Altogether in semester 2

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				
11	6	2	9		420	840	30	16.50

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<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

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

## Semester 3

### Obligatory courses number of ECTS points 8

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	ZMZ0135	Marketing and Management	2					K2ENG_W07	30	90	3	1.5	T	Z			KO	Ob
2	MSN0034	Failure Analysis of Machines and Devices	2					K2MBM_W05 K2MBM_K05	30	60	2	1	T	Z			K	Ob
3	MSN0034	Failure Analysis of Machines and Devices			1			K2MBM_U04	15	30	1	0.75	T	Z		P	K	Ob
4	MSN1561	Diploma Seminar					2	K2MBM_U06 K2MBM_U07 K2MBM_K01 K2MBM_K03 K2MBM_K04 K2MBM_K05	30	60	2	1.5	T	Z		P	K	Ob
Total			4		1		2		105	240	8	4.75						

### Optional courses (minimum 30 hours in semester) number of ECTS points 22

No.	Course/group of courses code	Name of course/group of courses (denote group of courses with symbol <b>GK</b> )	Weekly number of hours					Field-of-study educational effect symbol	Number of hours		Number of ECTS points		Form <sup>2</sup> of course/group of courses	Way <sup>3</sup> of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	total	BK classes <sup>1</sup>			universit y-wide <sup>4</sup>	practical <sup>5</sup>	kind <sup>6</sup>	type <sup>7</sup>
1	WFW01000BK	Sporting Classes		1				K2MBM_K06	15	15	1	1	T	Z	O	P	KO	W
2	ZSN100500BK	Management Course	1					K2MBM_W08 K2MBM_K05	15	30	1	0.5	T	Z	O		KO	W
3	MSN1612	Master Thesis						K2MBM_U07 K2MBM_K01 K2MBM_K04 K2MBM_K05		600	20	4	T	Z		P	K	W
Total			1	1					30	645	22	4.5						

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

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<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

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

### Altogether in semester 3

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				
5	1	1		2	135	885	30	9.25

### 2. Set of examinations in semestral arrangement

Course code	Names of courses ending with examination	Semester
MSN0531 MSN0161 MSN0341	1. Mechatronics and Control Systems 2. Compressor Refrigeration Systems 3. Cryogenics	1
MSN0617 MSN0121	1. Modelling and Optimisation 2. Absorption Refrigeration	2

### 3. Numbers of allowable deficit of ECTS points after particular semesters

Semester	Allowable deficit of ECTS points after semester
1	10
2	0