

DESCRIPTION OF THE PROGRAM OF STUDIES

Main field of study: Business Engineering

Profile: general academic

Level of studies: second-level studies

Form of studies: full-time studies

1. General description

<i>1.1 Number of semesters:3</i>	<i>1.2 Total number of ECTS points necessary to complete studies at a given level:90</i>
<i>1.3 Total number of hours:972</i>	1.4 Prerequisites (particularly for second-level studies): Graduate at least of first-level studies (bachelor of engineering). According to the resolution No. 37/3/2020-2024 of PWr Senate. from 19 November 2020
<i>1.5 Upon completion of studies graduate obtains professional degree of: Master of Science</i>	1.6 Graduate profile, employability: Description Responding to the needs of the market, the studies combine managerial competences with the improvement of IT skills. In both specializations, students will improve their skills in analyzing data from the market environment of enterprises, predictive analysis, algorithmic business thinking, cloud services for business, business

	<p>psychology, digital marketing as well as project and business management. The best students will be able to conduct research with our scientists with the prospect of working in an academic environment.</p> <p>At the second degree of Business Engineering (BE), students can deepen their acquired knowledge and extend it by choosing one of two specializations: English-language specialization (Business Intelligence, BI) focused on aspects related to business analytics or Polish-language specialization (Project Management, ZPR) oriented on the management of various types of projects (business, IT, social, public, scientific, etc.).</p> <p>Business Intelligence (BI) is designed to provide students with cutting edge business knowledge and a strong foundation in both analytics – including computational statistics and machine learning – and core business areas, building a solid platform for a successful career. This specialization focuses on how to analyze data in order to identify and predict patterns and on how to visualize and present results to support managerial decisions and lead to innovative thinking in today’s organizations.</p> <p>Acquired skills and competences</p> <p>Students will learn how to:</p> <ul style="list-style-type: none"> ● Use data analytics to stimulate business growth with newly discovered quantitative and qualitative skills. ● Stay on top of the latest methods and approaches in computational statistics and machine learning.
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^{MS4}University-wide classes /group of classes – enter O

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	<ul style="list-style-type: none"> ● Use cutting-edge techniques to immerse in case studies and apply new approaches to own data challenges. ● Use visualization software to identify trends, explore hypotheses, challenge assumptions, and create a more detailed, data-driven understanding of business activities. ● Conduct top-tier research and report the results to managers, peers and the public. ● Simulate realistic future paths of all kinds of business processes. ● Predict outcomes to enable making informed business decisions and developing winning strategies. ● Reach the right customers with the right products and communications. ● Leverage the power of data to make informed business decisions and thrive in a rapidly changing environment. <p>Career</p> <p>The demand for business analytics is high. Graduates who complete the Business Intelligence program in Business engineering will acquire computational skills and management expertise that the business world is actively seeking. Our program prepares students for data-driven decision support that is crucial for today's business activities across a broad range of industries including ICT, financial, energy and healthcare. The BE curriculum provides the skills to fill positions not only as business intelligence analysts, but also data analysts and consultants, revenue optimization analysts, risk managers, market analysts and many more. Given that the students</p>
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	will have the opportunity to conduct research with affiliated faculty and senior staff, the program also prepares for careers in Academia.
<p>1.7 Possibility of continuing studies: doctoral school, postgraduate (post diploma) studies</p>	<p>1.8 Indicate connection with University's mission and its development strategy:</p> <p>Business engineering graduates acquire business, analytical, social and technical competences. The educational program in Business engineering is coherent with the mission of Wrocław University of Science and Technology in the following areas:</p> <ul style="list-style-type: none"> ● Developing the professionalism and hard skills of graduates in business data analysis and project management that determine the functioning of the TechnoSphere ● Aiming to provide high quality classes and providing the students of Business engineering and lecturers with conditions enabling open discussion and constructive criticism; ● Developing the values and tradition of higher education, wide-ranging cooperation with other universities all over the world via students taking part in scientific conferences and the Erasmus program, and with employers via practical learning, carried out in the form of projects in specific organizations; ● Developing creative, critical and tolerant graduates, as studying a classes in Business engineering emphasizes on appropriate skills and attitudes development; ● Striving to obtain a worthy place in the field of training specialists in the field of management among domestic and foreign universities.

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The Faculty's development plan is in line with the University's strategy. In particular, the Faculty "... combines theoretical, research and expert competences with didactic and educational competences. The Faculty is a leading research and teaching center in Poland and a significant center on an international scale. The didactic and scientific-research profile as well as the quality of education and research in economic and technical sciences ensure it a suitable place in national and international rankings". Conducting Business engineering studies is a permanent element of the Faculty's development strategy. In line with the principle adopted at Wrocław University of Science and Technology, studies in the field of Business engineering have a general academic profile. The study curriculum meets all the requirements resulting from applicable law, including the Polish Qualifications Framework and the characteristics of obtaining engineering competences. In line with the University's strategy, in order to increase the attractiveness of studies on the educational market, the MSc studies education program is unique in that it uses the natural - in economic practice - complementarity of technical and economic education, enriched with an IT module. In accordance with the University's strategy and the Faculty's development plan, which indicate the need for links with the region and the economy, conditions are created and systematic contacts between students and enterprises and other institutions are forced in the didactic process.

In line with the University's development strategy, the quality of education is systematically improved. This is achieved thanks to the scientific development of employees and the increase in their teaching competences, as well as thanks to the systematic enrichment of the Faculty's infrastructure, including the modernization of the rooms as well as teaching and laboratory aids.

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	<p>At the second degree of studies in the field of Business engineering, the study curriculum includes a set of learning outcomes and the corresponding substantive content of education, enabling graduates to effectively compete on the labor market. Students are prepared to continue their third-cycle studies at the Doctoral School and to conduct their own research. Graduates are also aware of the need to constantly act for their own professional development in cooperation with their home university.</p>
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2. Detailed description

2.1 Total number of learning outcomes in the program of study: W (knowledge) =16, U (skills) = 27, K (competences) =7, W + U + K = 50

2.2 For the main field of study assigned to more than one discipline - the number of learning outcomes assigned to the discipline:

D1 Management and quality science (major): 36 (this number must be greater than half the total number of learning outcomes)

D2 Information and Technology Science: 14

2.3 For the main field of study assigned to more than one discipline - percentage share of the number of ECTS points for each discipline:

D1 54,4% ECTS points

D2 45,6 % ECTS points

2.4a. For the general academic profile of the main field of study – the number of ECTS points assigned to the classes related to the University's academic activity in the discipline or disciplines to which the main field of study is assigned – DN (must be greater than 50% of the total number of ECTS points from 1.2) 85

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2.4b. For the practical profile of the main field of study - the number of ECTS points assigned to the classes shaping practical skills (must be greater than 50% of the total number of ECTS points from 1.2)

2.5 Concise analysis of compliance of the assumed learning outcomes with the needs of the labor market

The assumed learning outcomes correspond to the requirements set by employers for employees/ graduates on the labor market, in particular in the field of:

- solving decision problems with the use of advanced data analysis methods, optimization and simulation methods with the use of professional IT systems,
- identifying and analyzing the needs of IT system users, managing the implementation of these systems and testing their usability,
- building a project portfolio and managing it in accordance with the goals of the organization,
- identifying, at the level of the entire organization, the real needs of individual business domains, in connection with the overall strategy of the organization,
- identifying and delivering the expected value to customers by managing relationships with them focused on achieving the goals of the organization.

Learning outcomes meet the demand for specialists/ managers prepared for data-driven decision support that is crucial for today's business activities across a broad range of industries including ICT, financial, energy and healthcare. The BI curriculum provides the skills to fill positions not only as business intelligence analysts, but also data analysts and consultants, revenue optimization analysts, risk managers, market analysts and many more. BE graduates are capable of integrating engineering knowledge and skills in the field of management and quality sciences in relation to solving complex substantive and managerial problems. The competences obtained in the classes of education will enable the graduate to effectively carry out tasks in individual areas of the organization's activities, in particular in the field of:

- decision optimization,
- flexibility and risk management,
- supporting managerial decisions,
- information systems management.

The program of studies in the field of Business Engineering at the second-cycle studies and many years of experience of the teaching staff create conditions for the graduates to achieve the assumed learning outcomes and meet the above requirements formulated by employers.

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2.6. The total number of ECTS points that a student must obtain in classes requiring direct participation of academic teachers or other persons conducting classes and students (enter the sum of ECTS points for classes / groups of classes marked with the BU¹ code) **45,16 ECTS**

2.7. Total number of ECTS points, which student has to obtain from basic sciences classes

Number of ECTS points for obligatory classes	9
Number of ECTS points for optional classes	0
Total number of ECTS points	9

2.8. Total number of ECTS points, which student has to obtain from practical classes, including project and laboratory classes (enter total number of ECTS points for classes/group of classes denoted with code P)

Number of ECTS points for obligatory classes	25
Number of ECTS points for optional classes	40
Total number of ECTS points	65

2.9. Minimum number of ECTS points, which student has to obtain doing education blocks offered as part of University-wide classes or other main field of study (enter number of ECTS points for classes/groups of classes denoted with code O)
3 ECTS points

2.10. Total number of ECTS points, which student may obtain doing optional blocks (min. 30% of total number of ECTS points)
49 ECTS points

3. Description of the process leading to learning outcomes acquisition:

The process leading to the achievement of the learning outcomes includes active participation in classes organized at the university: lectures, classes, laboratories, projects and seminars, as well as independent studies allowing for consolidation, supplementation and extension of knowledge. If necessary, the student can take advantage of individual consultations.

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4. List of education blocks:

4.1. List of obligatory blocks:

4.1.1 List of general education blocks

4.1.1.1 Liberal-managerial classes block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
		Total																	

4.1.1.2 Foreign languages block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
		Total																	

4.1.1.3 Sporting classes block (0 ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷

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Total																				

4.1.1.4 Information technologies block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

Altogether for general education blocks

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					

4.1.2 List of basic sciences blocks

4.1.2.1 Mathematics block

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	W08IZZ- SM8028W	Descriptive analytics	2				K2_IZ_W2,4,5 U2,8-11, K1	30	100	4	4	1,36	T/Z	E		DN	P	PD	
2.	W08IZZ- SM8028L	Descriptive analytics			2		K2_IZ_W2,4,5 U2,8-11, K1	30	50	2	2	1,28	T	Z		DN	P	PD	
Total			2	0	2	0		60	150	6	6	2,64							

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4.1.2.2 Physics block

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	W08IZZ- SM8027G	Physics of complex systems GK	1		1			K2_IZ_W11 U10,11,20,21 K1	30	75	3	3	1,36	lec:T/Z lab:T	Z		DN	P (2)	PD
Total			1	0	1	0	0		30	75	3	3	1,36						

4.1.2.3 Chemistry block

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

Altogether for basic sciences blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
3	0	3	0	0	90	225	9	9	4

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4.1.3 List of the main field of study blocks

4.1.3.1 Obligatory main field of study blocks

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	W08IZZ- SM8025G	Creative and design thinking workshop GK				1	2	K2_IZ_W9 U10,11,18,22,23 K1-7	45	75	3	3	1,96	T	Z		DN	P	K
2.	W08IZZ- SM8035G	Business simulations GK	1		2			K2_IZ_W1 U1,4,5,10,11, K1	45	100	4	4	1,96	lec:T/Z lab:T	Z		DN	P	K
3.	W08IZZ- SM8035P	Business simulations				1		K2_IZ_W1 U1,4,5,10,11, K1	15	50	2	2	0,68	T	Z		DN	P	K
4.	W08IZZ- SM8036G	Contemporary economics GK	1			1		K2_IZ_W6,7,9,13, 14,U10,11,15,16,18 ,24,25, K1	30	50	2	2	1,36	lec:T/Z lab:T	Z		DN	P (1)	K
5.	W08IZZ- SM8026W	Contemporary management	2					K2_IZ_W6,7,9,13, 14, U10,11,15- 18,24,25, K1	30	50	2	2	1,28	T/Z	Z		DN		K
6.	W08IZZ- SM8026S	Contemporary management					2	K2_IZ_W6,7,9,13, 14, U10,11,15- 18,24,25, K1	30	50	2	2	1,28	T	Z		DN	P	K
7.	W08IZZ- SM8009G	Digital marketing and social media GK	1		2	1		K2_IZ_W7,9 U10,11,15, K1	60	100	4	4	2,64	lec:T/Z lab:T	Z		DN	P (3)	K
8.	W08IZZ- SM8012W	Games and decisions in management	2					K2_IZ_W1,4,5,9,1 0 U1,5,8-11,26, K1	30	50	2	2	1,28	T/Z	Z		DN		K
9.	W08IZZ- SM8012L	Games and decisions in management			2			K2_IZ_W1,4,5,9,1 0 U1,5,8-11,26, K1	30	50	2	2	1,28	T	Z		DN	P	K
10.	W08IZZ- SM8014W	Project management	1					K2_IZ_W,8- 10,15,16 U10, 11, 17, 19, 22, 27, K1	15	50	2	2	0,76	T/Z	E		DN		K
11.	W08IZZ- SM8014L	Project management			2			K2_IZ_W,8- 10,15,16	30	50	2	2	1,28	T	Z		DN	P	K

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								U10, 11, 17, 19, 22, 27, K1											
12.	W08IZZ-SM8014P	Project management				1		K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	15	50	2	2	0,68	T	Z		DN	P	K
13.	W08IZZ-SM8017G	Cloud computing services GK			1		1	K2_IZ_W3 U3,6,10,11, K1	30	50	2	2	1,36	T	Z		DN	P	K
14.	W08IZZ-SM8033S	Research workshop					1	K2_IZ_U8,10,11,26, K1,5,6	15	25	1	1	0,68	T	Z		DN	P	K
Total			8	0	9	5	6		420	800	32	32	18,48						

4.1.3.2 block

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

Altogether (for main field of study blocks):

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
8	0	9	5	6	420	800	32	32	18,48

4.2 List of optional blocks

4.2.1 List of general education blocks

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4.2.1.1 Liberal-managerial classes blocks (min. 6 ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	IZZ- SM3BISCM	Social competences module					2		30	50	2	2	1,28	T	Z		DN	P	KO
	W08IZZ- SM8023S	Business psychology					2	K2_IZ_W12,16 U7,10,11,22,23, K1-5,7	30	50	2	2	1,28	T	Z		DN	P	KO
	W08IZZ- SM8024S	Leading teams and work groups					2	K2_IZ_W12,16 U7,10,11,22,23 K1-5,7	30	50	2	2	1,28	T	Z		DN	P	KO
2.	IZZ- SM3BIBM	Business module	1				1(0) 0(1)		30	50	2	2	1,36	T	Z		DN	P	KO
	W08IZZ- SM8021G	Business planning GK	1			1		K2_IZ_W6,7,14 U7,10,11,15-17,24,25 K1	30	50	2	2	1,36	T	Z		DN	P	KO
	W08IZZ- SM8020G	Business models in developing environment GK	1			1		K2_IZ_W6,7,14 U10,11,15-18,24,25 K1	30	50	2	2	1,36	T	Z		DN	P	KO
	W08IZZ- SM8022G	Corporate Social Responsibility GK	1			1		K2_IZ_W6,7,14 U10,11,15,16,18,24, 25, K1	30	50	2	2	1,36	T	Z		DN	P	KO
3.	IZZ- SM3BIEM	Ethics module	1				1		30	50	2		1,36	T	Z			P	KO
	W08IZZ- SM8038	Ethics of new technologies GK	1				1	K2_IZ_K7	30	50	2		1,36	T	Z			P	KO
	W08IZZ- SM8037	Ethic of management and new technologies GK	1				1	K2_IZ_K7	30	50	2		1,36	T	Z			P	KO
	W08IZZ- SM8039	Business ethics GK	1				1	K2_IZ_K7	30	50	2		1,36	T	Z			P	KO
Total			2	0	0	1(0)	2(3)		90	150	6	4	4,00						

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

⁴University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

4.2.1.2 Foreign languages block (min. 3 ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	JZL	Foreign language (B2+)		1				K2_IZ_U10-14 K2_IZ_K1	15	30	1		0,5	T	Z	O		P	KO
2.	JZL	Foreign language (A1 or A2)		3				K2_IZ_U10-14 K2_IZ_K1	45	60	2		1,5	T	Z	O		P	KO
Total			0	4	0	0	0		60	90	3		2,0						

4.2.1.3 Sporting classes block (0. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

4.2.1.4 Information technologies block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

⁴MS University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

Altogether for general education blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
2	4	0	1(0)	2(3)	150	240	9	4	6

4.2.2 List of basic sciences blocks

4.2.2.1 Mathematics block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

4.2.2.2 Physics block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total																			

4.2.2.3 Chemistry block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

group of classes code	lec	cl	lab	pr	sem	Learning effect symbol	ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes	University-wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
Total															

Altogether for blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					

4.2.3 List of blocks

4.2.3.1 Diploma profile block (min. 16 ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University-wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	W08IZZ-SM8032S	Diploma seminar					1	K2_IZ_U10,11,26 K2_IZ_K1,5,6,7	15	50	2	2	0,68	T	Z		DN	P	S
2.	W08IZZ-SM80034D	Diploma Thesis					1	K2_IZ_U10,11,26 K2_IZ_K1,6,7	12	350	14	14	3,48	T/Z	Z		DN	P	S
Total			0	0	0	1	1		27	400	16	16	4,16						

Altogether for blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

⁴MS⁴University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

lec	cl	lab	pr	sem					
0	0	0	1	1	27	400	16	16	4,16

4.2.4 List of specialization blocks

4.2.4.1 Specialization classes (e.g. whole specialization) blocks (min. 24 ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷
1.	W08IZZ- SM8029G	Business intelligence workplace GK	1		2	1		K2_IJ_W1-3, 5 K2_IJ_U3,9-11 K2_IJ_K1	60	125	5	5	2,64	lec:T/Z lab,pr:T	Z		DN	P (4)	S
2.	W08IZZ- SM8013G	Predictive analytics GK	2		2			K2_IJ_W1,4,5 U1,5,8-11,26,K1	60	150	6	6	2,64	lec:T/Z lab:T	E (lec)		DN	P (3)	S
3.	W08IZZ- SM8030G	Visual analytics GK	1		1	1		K2_IJ_W1-4 U1,2,3,9-11, K1	45	75	3	3	2,04	lec:T/Z lab:T	Z		DN	P (2)	S
4.	W08IZZ- SM8031G	Web scraping and analysis GK	2		1			K2_IJ_W2 U2,6,7,10,11, K1	45	100	4	4	1,96	lec:T/Z lab:T	Z		DN	P (2)	S
5.	W08IZZ- SM8019W	Prescriptive analytics	2					K2_IJ_W1,4,5 U1,4,5,8-11,26, K1	30	50	2	2	1,28	T/Z	Z		DN		S
6.	W08IZZ- SM8019L	Prescriptive analytics			2			K2_IJ_W1,4,5 U1,4,5,8-11,26, K1	30	75	3	3	1,28	T	Z		DN	P	S
7.	W08IZZ- SM8040S	BI Day				1		K2_IJ_U10,11,26 K2_IJ_K1 K2_IJ_K5 K2_IJ_K6 K2_IJ_K7	15	25	1	1	0,68	T	Z		DN	P	S
Total			8	0	8	2	1		285	600	24	24	12,52						

4.2.4.2 ... block (min. ECTS points):

No.	Subject/ group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form ² of subject/group of classes	Way ³ of crediting	Subject/group of classes			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes			University- wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

⁴MS University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

group of classes code	Name of subject/group of classes (denote group of classes with symbol GK)	lec	cl	lab	pr	sem	Learning effect symbol	ZZU	CNPS	Total	DN ⁵ classes	BU ¹ classes	University-wide ⁴	Concerning scientific activities ⁵	Practical ⁶	Type ⁷

Altogether for specialization blocks:

Total number of hours					Total number of ZZU hours	Total number of CNPS hours	Total number of ECTS points	Total number of ECTS points for DN classes ⁵	Number of ECTS points for BU classes ¹
lec	cl	lab	pr	sem					
8	0	8	2	1	285	600	24	24	12,52

4.3 Training block - concerning principles of training crediting – attachment no. ...

Opinion of the Advisory Faculty Council concerning the rules of crediting training block

Name of training			
Number of ECTS points	Number of ECTS points for BU ¹ classes	Training crediting mode	Code
Training duration		Training objective	

4.4 „Diploma dissertation” block (if it is foreseen at first level studies)

Type of diploma dissertation	Magister inżynier	
Number of diploma dissertation semesters	Number of ECTS points	Code
2	2	W08IZZ-SM8032S Diploma seminar
	14	W08IZZ-SM8034D Diploma Thesis
Character of diploma dissertation		

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

Literature survey, project, computer program, etc.	
Number of BU¹ ECTS points	3,48
Number of ECTS points DN⁵	16

5. Ways of verifying assumed learning outcomes

Type of classes	Ways of verifying assumed learning outcomes
lecture	Examination or colloquium or other form indicated in the classes charter
classes	Colloquium (knowledge test or open questions); solving tasks; literature and case studies, diagnostic or project reports - empirical research in real organizations, opinions of representatives of these organizations; oral presentations with the use of modern means of communication; other form indicated in the classes charter
laboratory	Report on tasks performed, knowledge test; other form indicated in the classes charter
project	Written report documenting the diagnostic-project solution, presentation of the project and its defense; other form indicated in the classes charter
seminar	Selection - formulation of the problem - topic; activity in discussion, written elaboration in the form of a scientific paper, essay, "mini" monograph; oral presentations using modern means of communication; other form indicated in the classes charter
internship	not applicable

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

6. Range of diploma examination

Creative and design thinking workshop

1. Real-world applications of design thinking
 - 1.1. Give and describe two examples of products developed using the design thinking process
2. Creative thinking techniques
 - 2.1. Give and describe two techniques of creative thinking with examples of their application from real-world businesses.

Physics of complex systems

3. Models of complex systems
 - 3.1. Give one example of a model of a complex system and describe its applications.
4. Complex Networks
 - 4.1. What are the three main models of complex networks? Compare two of them, selected by you.

Business simulations

5. The concept of simulation. The cycle of simulation study
 - 5.1. What is simulation and what are the goals of a simulation? List and briefly discuss the basic steps in a simulation study.
6. Main simulation methods used in management
 - 6.1. Name main simulation methods used to support decision making in management and characterize one of them. Give examples of applications.

Descriptive analytics

7. Linear relationship between variables
 - 7.1. What is a linear regression and how can you estimate it?
8. Nonlinear relationship between variables
 - 8.1. Provide and describe an example of a nonlinear model which can be used to describe a relationship between variables. How can you estimate it?

Business intelligence workplace

9. Descriptive analytics - data visualization tools

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²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

9.1 What tools can be used (in your preferred programming language) to visualize categorical, discrete and continuous data. Provide examples and elaborate on the pros and cons.

10. Predictive analytics tools and models

10.1 Describe a sample forecasting problem. What type of methods (algorithms, models) and what software would you use to compute the forecasts? Elaborate on the pros and cons of your choice.

Contemporary economics

11. Phases of the business cycle

11.1 List and characterize the phases of the business cycle (4 phases).

12. Market structures

12.1 Describe the least competitive market structure. Indicate its advantages and disadvantages.

Contemporary management

13. New business models and organizational designs

13.1 Describe a virtual organization. Give an example.

14. Leadership and decision making

14.1 What are the differences between leadership and management?

Digital marketing and social media

15. Search Engine Optimization (SEO) techniques

15.1 Describe at least 5 things that are crucial for SEO techniques.

16. Social media marketing content

16.1 Describe the underlying factors that you would consider before designing content for social media marketing.

17. Social media marketing, branding and Public Relations (PR)

17.1 Describe the differences among the objectives of marketing, branding, and PR through Social Media.

Game and decisions in management

18. Risk and uncertainty modeling in optimization problems

18.1 What are risk measures? Give examples of risk measures with their interpretations.

19. Non-cooperative games

19.1 Describe the concept of equilibrium in non-cooperative games.

20. Cooperative games

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

20.1 Describe solution concepts of cooperative games.

Predictive analytics

21. Regression vs neural networks

21.1 Describe the similarities and differences between regression and neural network models (linearity, training, stability of forecasts, computational time).

22. Point and probabilistic forecasts

22.1 Describe the concept of quantile regression and quantile regression averaging (QRA).

Visual analytics

23. Application of statistical methods in the visualization and analysis of business data.

23.1 Give examples of statistical methods used in data visualization. Describe the concept of one of them.

24. Application of cluster analysis and decision trees algorithms in visualization to support managerial decisions.

24.1 Give examples of cluster analysis algorithms that are used in data visualization and analysis. Describe the concept of one of them.

Web scraping and analysis

25. Methods of web scraping

25.1 What is HTML parsing and what tools will you use in this regard?

25.2 Explain what is data extraction via API? Point out its pros and cons.

Project management

26. Time management of project implementation

26.1 Discuss the Earned Value Method (EVM) for project control.

27. Project stakeholders management

27.1 Discuss at least three ways to classify project stakeholders and at least three types of project stakeholder management activities.

28. Project metrics

28.1 Assuming the definition of project success based on the value provided to stakeholders, present the principles of selecting metrics for a project.

Cloud computing services

29. Cloud services for business - applications, advantages, disadvantages, and security

29.1 What are the features and business applications of Microsoft cloud services?

29.2 What are the features and business applications of Google cloud services?

Prescriptive analytics

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

- 30 Decision making: methods to evaluate alternatives
- 30.1 Describe the differences among the main Multi-Criteria Decision Making methods.
- 31 Decision making: efficiency assessment
- 31.1 Describe three scalarizing functions that can be used in Multi-objective Mathematical Programming.
- 32 Decision making: building composite indicators
- 32.1 Describe the methods that can be used to build composite indices.

Business module

- 33 The role of planning in an organization
- 33.1 Explain why proper planning in an organization is crucial for its success.
- 34 Sustainable development of an organization - methods, values
- 34.1 How to develop a sustainable system for an organization?

Social competences module

Business psychology

- 35. Psychology of leadership
- 35.1 What factors determine a successful relationship between the leader and employees?
- 36. Psychology at work
- 36.1. Provide three main sources of occupational stress along with an argument why you chose these sources of stress.

Leading teams and work groups

- 37. Emergence, development, and leadership of teams
- 37.1. Briefly present team processes of the 2 most innovative teams of the world.
- 38. Managing team diversity
- 38.1 What are the main obstacles to communicate effectively in culturally diverse teams?

Ethics module

- 39. Ethical and philosophical aspects of management
- 39.1 What ethical issues are related to management, especially in the context of technology use and AI development?

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²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes

7. Requirements concerning deadlines for crediting classes/groups of classes for all classes in particular blocks

<i>No.</i>	<i>Subject / group of classes code</i>	<i>Name of subject / group of classes</i>	<i>Crediting by deadline of... (number of semester)</i>

8. Plan of studies (attachment no. 3)

Approved by faculty student government legislative body:

.....
Date

.....
name and surname, signature of student representative

.....
Date

.....
Dean's signature

¹BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes

²Traditional – enter T, remote – enter Z

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

^{MS4}University-wide classes /group of classes – enter O

⁵DN - number of ECTS points assigned to the classes related to the University's academic activity in the discipline/disciplines to which the main field of study is assigned

⁶Practical subject / group of classes – enter P. For the group of classes – in brackets enter the number of ECTS points assigned to practical classes

⁷KO – general education classes, PD – basic sciences classes, K – main field of study classes, S – specialization classes