Zał. Nr 1 do ZW 16/2020

PROGRAM OF STUDIES

FACULTY: Faculty of Management
MAIN FIELD OF STUDY: Business Engineering
BRANCH OF SCIENCE: Social sciences / Engineering and Technology
DISCIPLINES: D1 Management and quality studies (major discipline)
D2 Computer Engineering and Telecommunications

EDUCATION LEVEL: second-level studies
FORM OF STUDIES: full-time studies
PROFILE: general academic
LANGUAGE OF STUDY: English

Content:

Resolution no. … of the Senate of Wroclaw University of Science and Technology

In effect since education cycle 2021/2022

Zał. Nr 2 do ZW 16/2020
Attachment no. 1. to the Program of Studies

ASSUMED LEARNING OUTCOMES

FACULTY: Faculty of Management
MAIN FIELD OF STUDY: Business Engineering
EDUCATION LEVEL: second-level studies
PROFILE: general academic

Location of the main-field-of study:

Branch of science: Social sciences/ Engineering and Technology
Discipline / disciplines (for several disciplines, please indicate the major discipline)

D1: Management and quality studies (major discipline)
D2: Computer Engineering and Telecommunications

Explanation of the markings:
P7U – universal first degree characteristics corresponding to education at the second-level studies - 7 PRK level

P7S – second degree characteristics corresponding to education at the second-level studies - 7 PRK level

W - category "knowledge"
U - category "skills"
K - category "social competences"
K (*faculty symbol*) _W1, K (*faculty symbol*) _W2, K (*faculty symbol*) _W3, … - main-field-of study learning outcomes related to the category "knowledge"
K (*faculty symbol*) _U1, K (*faculty symbol*) _U2, K (*faculty symbol*) _U3, … - main-field-of study learning outcomes related to the category "skills"
K (*faculty symbol*) _K1, K (*faculty symbol*) _K2, K (*faculty symbol*) _K3, … - main-field-of study learning outcomes related to the category "social competences"
S (*faculty symbol*) _W.., S (*faculty symbol*) _W.., S (*faculty symbol*) _W.., … - specialization learning outcomes related to the category "knowledge"
S (*faculty symbol*) _U.., S (*faculty symbol*) _U.., S (*faculty symbol*) _U.., … - specialization learning outcomes related to the category "skills"
S (*faculty symbol*) _K.., S (*faculty symbol*) _K.., S (*faculty symbol*) _K.., … - specialization learning outcomes related to the category "social competences"
… _inż. – learning outcomes related to the engineer competences

Main field of study learning outcomes	Description of learning outcomes for the main-field-of study **BUSINESS ENGINEERING** After completion of studies, the graduate:	Reference to PRK characteristics		
		Universal first degree characteristics (U)	Second degree characteristics typical for qualifications obtained in higher education (S)	
			Characteristics for qualifications on 7 levels of PRK	Characteristics for qualifications on 6 and 7 levels of PRK, enabling acquiring engineering competences
KNOWLEDGE (W)				
K2_IZ_W1	Knows and understands advanced IT models, methods and tools, especially simulation tools, used to solve management decision-making problems.	P7U_W	P7S_WG P7S_WK	
K2_IZ_W2	Knows and understands the methods and IT tools of data preparation, coming from various sources, necessary to make business decisions.	P7U_W	P7S_WG P7S_WK	
K2_IZ_W3	Knows and understands technologies, the most important functions and applications of IT solutions supporting business.	P7U_W	P7S_WG P7S_WK	
K2_IZ_W4	Knows and understands to a greater extent theoretical methods (mathematical, econometric, statistical, forecasting) used to support decision-making processes, including explaining the complex relationships between the phenomena occurring in these processes in the area of management.	P7U_W	P7S_WG	P7S_WG_inż
K2_IZ_W5	Knows professional IT packages for modeling and statistical and econometric analyzes supporting the solution of decision problems in management processes.	P7U_W	P7S_WG	P7S_WG_inż
K2_IZ_W6	Identifies inter-organizational relations and interactions of the organization with the environment in the context of national, international and intercultural conditions. Explains and illustrates the impact of the environment on the activities of the organization.	P7U_W	P7S_WK	
K2_IZ_W7	Has extended and in-depth substantive knowledge of the organization and functioning of the enterprise in the field of strategic management, logistics, marketing, finance, and business architecture.	P7U_W	P7S_WG P7S_WK	
K2_IZ_W8	Has in-depth knowledge of technical means and IT systems of communication in organizations (including the processes	P7U_W	P7S_WG	P7S_WG_inż

	taking place in their life cycle) and knows the features of an efficient communication process.			
K2_IZ_W9	Has in-depth knowledge of the methods and techniques of diagnosing and improving activities in individual functional areas of the organization and selected methods of researching the environment of the enterprise. He knows the norms and standards in individual functional areas.	P7U_W	P7S_WG	P7S_WG_inż
K2_IZ_W10	He knows and understands the in-depth understanding of the essence of risk, its sources and the need to limit it in the functioning of enterprises. He knows the principles of risk management and the methods of its measurement and methods of its estimation and reduction.	P7U_W	P7S_WG	
K2_IZ_W11	Knows and understands the interactions occurring in selected physical systems between their individual elements and people (employees) functioning within them.	P7U_W	P7S_WK	P7S_WG_inż
K2_IZ_W12	Knows and understands the social decision-making and leadership mechanisms in an organization.	P7U_W	P7S_WG	
K2_IZ_W13	Knows and understands the norms and standards (economic, legal, organizational and ethical) that determine the context of the economy and organization.	P7U_W	P7S_WK	
K2_IZ_W14	Knows and understands the concepts, theories, methods and instruments in the field of economic and legal policy used to regulate the economy.	P7U_W	P7S_WG	
K2_IZ_W15	Knows and deeply understands the process of project management and project portfolio at all stages of its implementation, in particular, he knows the advanced level of agile methodologies as well as mathematical and IT tools.	P7U_W	P7S_WG	P7S_WG_inż P7S_WK_inż
K2_IZ_W16	Has an extended and in-depth knowledge of the principles of building and functioning teams and the factors influencing their efficiency	P7U_W	P7S_WG	
SKILLS (U)				
K2_IZ_U1	Can choose methods and IT tools, especially simulation ones, to build models of management decision problems, and perform experiments to assess the effects of decision variants.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U2	Using IT tools, student can search, combine, organize and present data for the purposes of making business decisions.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U3	Using IT tools student can analyze the requirements of available technologies and plan the use of IT solutions supporting business.	P7U_U	P7S_UW	P7S_UW_inż

K2_IZ_U4	By participating in business decision-making processes, is able to plan and carry out experiments and - by making measurements and computer simulations - to interpret the obtained results and draw conclusions.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U5	Can use analytical, simulation and experimental methods to identify and formulate specifications of engineering tasks and to solve them.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U6	Can make a critical analysis of the functioning of the existing IT tools for management and evaluate these solutions and - in accordance with the given specification - design and implement simple IT tools typical for management, using appropriately selected appropriate methods, techniques, technologies and tools.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U7	Can use knowledge in the selection of sources and information necessary to build complex models of decision-making processes and make a critical and synthetic analysis of this information.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U8	Can use knowledge to formulate and test hypotheses verifying the usefulness of methods and models to support decision-making processes in the area of management.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U9	Can use knowledge in the field of knowledge of professional IT packages for modeling and statistical analyzes for the purpose of solving decision problems in the area of management.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U10	Can use specialized language to communicate in the professional environment in the field of specific issues in the area of management and quality sciences - in Polish and a foreign language (1).	P7U_U	P7S_UK	
K2_IZ_U11	Understands Polish and foreign (1) texts in the field of management, can interpret them, draw conclusions, obtain necessary information, interpret and critically evaluate them, read professional literature, business and organizational documentation with understanding.	P7U_U	P7S_UK	
K2_IZ_U12	Speaks a foreign language (2) sufficiently understandable for a native speaker of the language and uses basic linguistic measures relating to the specific needs of everyday life, both in written and spoken form.	P7U_U	P7S_UK	
K2_IZ_U13	Uses basic skills in a foreign language (2): understands simple spoken and read texts, can establish social contacts,	P7U_U	P7S_UK	

	expresses coherently on a known topic, can write an e-mail, card or note.			
K2_IZ_U14	Distinguishes and uses to a limited extent the official and unofficial variety of a foreign language (2) and uses basic sociocultural knowledge in communication in a given foreign language (2).	P7U_U	P7S_UK	
K2_IZ_U15	Has the ability to analyze the causes and dynamics of phenomena in the organization's environment in the conditions of a market economy and the applicable economic and legal regulations.	P7U_U	P7S_UW P7S_UK	
K2_IZ_U16	Is able to analyze and evaluate goals, features, elements, processes, functional areas in the enterprise as well as internal and inter-organizational relations, using concepts and theoretical approaches in the field of social sciences, in particular the discipline of management and quality science.	P7U_U	P7S_UW P7S_UK	
K2_IZ_U17	Is able, using appropriate methods and tools, to design: systems and processes in the area of logistics, enterprise strategy, business architecture, communication management and projects implemented in the form of projects.	P7U_U	P7S_UW P7S_UK	P7S_UW_inż
K2_IZ_U18	Can formulate innovative alternative solutions to management and substantive problems in the enterprise. Can justify, make a choice and verify them in accordance with the established priorities. Can plan actions to solve them.	P7U_U	P7S_UW P7S_UK	P7S_UW_inż
K2_IZ_U19	Can identify risk factors and assess their impact on the course and results of the process and propose preventive actions.	P7U_U	P7S_UW P7S_UK	P7S_UW_inż
K2_IZ_U20	Can plan the course of measurements and evaluation of the parameters of selected physical systems, also taking into account the human factor.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U21	Can describe selected issues encountered in everyday and professional life using mathematical and physical formalism and draw conclusions.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U22	Can solve problems in communicating with diverse groups of recipients in team forms of work organization.	P7U_U	P7S_UK	
K2_IZ_U23	Can identify behavioral factors and methods influencing team work management, decision making and assuming the role of a leader in the organization.	P7U_U	P7S_UO	
K2_IZ_U24	Can use his knowledge to analyze economic phenomena and solve economic problems as well as adapt, justify and apply	P7U_U	P7S_UW	

	appropriate norms and standards (economic, legal, social) in specific activities in the organization.			
K2_IZ_U25	Can use his knowledge to identify the potential effects of the introduced economic and legal regulations for enterprises.	P7U_U	P7S_UW	
K2_IZ_U26	Has developed research skills: formulates simple hypotheses and research problems, selects adequate methods, techniques and research tools, develops, presents and interprets research results, draws conclusions, indicates directions for further research in the field of management and quality sciences, technical information technology and telecommunications.	P7U_U	P7S_UW	P7S_UW_inż
K2_IZ_U27	Is able to identify - at an advanced level, complex and unusual management and substantive problems in projects implemented in the form of a project.	P7U_U	P7S_UW P7S_UK	P7S_UW_inż
SOCIAL COMPETENCES (K)				
K2_IZ_K1	Is ready to take actions to comply with the principles of professional ethics.	P7U_K	P7S_KR	
K2_IZ_K2	Can cooperate and work in group and team forms of work organization (assuming different roles in them).	P7U_K	P7S_KR P7S_KO	
K2_IZ_K3	is ready to flexibly search for and select methods and tools for solving problems arising in the workplace.	P7U_K	P7S_KK	
K2_IZ_K4	Is ready to lead and take responsibility for the group, organize and manage his own and others' work, taking into account the changing individual, team and organizational needs.	P7U_K	P7S_KR P7S_KO	
K2_IZ_K5	Is ready to critically assess and resolve problems (recognizing the importance of expert knowledge and opinions) regarding decision-making and leadership in the group and organization, including meeting social obligations and initiating activities for the public interest and the social environment.	P7U_K	P7S_KK P7S_KO	
K2_IZ_K6	Is aware of the need for an independent, critical assessment of the scope and level of his knowledge and professional skills, both in the field of management and quality sciences, technical informatics and telecommunications, as well as in the interdisciplinary dimension. Is prepared to independently search for areas of knowledge to supplement and skills to improve.	P7U_K	P7S_KK P7S_KO P7S_KR	
K2_IZ_K7	Is prepared to behave in a professional and ethical manner; perceives and formulates ethical dilemmas related to his own and someone else's work; seeks appropriate solutions and the	P7U_K	P7S_KK P7S_KO	

	possibility of correcting irregularities in their attitudes and behavior in the workplace.		P7S_KR	

Zał. nr 3 do ZW 16/2020
Attachment no. 2. to the Program of Studies

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

*1.1 Number of semesters:***3**	*1.2 Total number of ECTS points necessary to complete studies at a given level:****90***
*1.3 Total number of hours:***900**	*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**
1.5 Upon completion of studies graduate obtains professional degree of: ***Master of Science***	*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

	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. 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.). 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. **Acquired skills and competences** Students will learn how to: • 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.

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
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	• 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. **Career** 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

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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.
1.7 Possibility of continuing studies: **doctoral school, postgraduate (post diploma) studies**	*1.8 Indicate connection with University's mission and its development strategy:* 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: • 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 courses 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 course 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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	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.

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): 35 (this number must be greater than half the total number of learning outcomes)

D2 Information and Technology Science: 15

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 51% ECTS points

D2 49 % ECTS points

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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) 87

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 course 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.

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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.

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 courses / groups of courses marked with the BU[1] code) **62,9 ECTS**

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

Number of ECTS points for obligatory subjects	11
Number of ECTS points for optional subjects	0
Total number of ECTS points	11

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 courses/group of courses denoted with code P)

Number of ECTS points for obligatory subjects	27
Number of ECTS points for optional subjects	39
Total number of ECTS points	66

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 courses/groups of courses 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)

48 ECTS points

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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.

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 subjects* block *(min. ..... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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.	Course/	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours		Number of hours	Number of ECTS points	Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	group of courses 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																	

4.1.1.3 *Sporting classes* block *(0 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
		Total																	

4.1.1.4 *Information technologies* block *(min. .... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
		Total																	

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

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.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	MAZ2581W	Descriptive analytics	2					K2_IZ_W2,4,5 U2,8-11, K1	30	120	4	4	2,8	T/Z	E		DN	P	PD
2.	MAZ2581L	Descriptive analytics			2			K2_IZ_W2,4,5 U2,8-11, K1	30	90	3	3	2,1	T	Z		DN	P	PD
		Total	**2**	**0**	**2**	**0**	**0**		**60**	**210**	**7**	**7**	**4.9**						

4.1.2.2 *Physics* block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
	FZZ2515WI	Physics of complex systems **GK**	1		1			K2_IZ_W11 U10,11,20,21 K1	30	120	4	4	2,1	w:T/Z l:T	Z		DN	P (2)	PD

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	Total	**1**	**0**	**1**	**0**	**0**		**30**	**120**	**4**	**4**	**2,8**						

4.1.2.3 *Chemistry* block

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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	330	11	11	7,7

4.1.3 List of the main field of study blocks

4.1.3.1 *Obligatory main field of study* blocks

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2000P	Creative and design thinking workshop					2	K2_IZ_W9 U10,11,18,22,23 K1-7	30	60	2	2	2,1	T	Z		DN	P	K
2.	IZZ2001Lw	Business simulations **GK**	1		2			K2_IZ_W1 U1,4,5,10,11, K1	45	150	5	5	3,5	w:T/Z l:T	Z		DN	P	K
3.	IZZ2001P	Business simulations				1		K2_IZ_W1 U1,4,5,10,11, K1	15	30	1	1	0,7	T	Z		DN	P	K
4.	EKZ2506Sw	Contemporary economics **GK**	1				1	K2_IZ_W6,7,9,13,14,U10, 11,15,16,18,24,25, K1	30	90	3	3	2,1	w:T/Z l:T	Z		DN	P (1)	K
5.	ZMZ2661S	Contemporary management					2	K2_IZ_W6,7,9,13,14, U10,11,15-18,24,25, K1	30	60	2	2	1,4	T	Z		DN	P	K
6.	IZZ2003Pwl	Digital marketing and social media **GK**	1		2	1		K2_IZ_W7,9 U10,11,15, K1	60	120	4	4	2,8	w:T/Z l:T	Z		DN	P (3)	K
7.	IZZ2004W	Games and decisions in management	2					K2_IZ_W1,4,5,9,10 U1,5,8-11,26, K1	30	60	2	2	1,4	T/Z	Z		DN		K
8.	IZZ2004L	Games and decisions in management			2			K2_IZ_W1,4,5,9,10 U1,5,8-11,26, K1	30	60	2	2	1,4	T	Z		DN	P	K
9.	ZMZ2662W	Project management	1					K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	15	60	2	2	1,4	T/Z	E		DN		K
10.	ZMZ2662L	Project management			2			K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	30	60	2	2	1,4	T	Z		DN	P	K
11.	ZMZ2662P	Project management				1		K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	15	60	2	2	1,4	T	Z		DN	P	K
12.	IZZ2007Sl	Cloud computing services **GK**			1		1	K2_IZ_W3 U3,6,10,11, K1	30	120	4	4	2,8	T	Z		DN	P	K
		Total	**6**	**0**	**9**	**3**	**6**		**360**	**930**	**31**	**31**	**21,7**						

4.1.3.2 ..... block

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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					
6	0	9	3	6	360	930	31	31	21,7

4.2 List of optional blocks

4.2.1 List of general education blocks

4.2.1.1 Liberal-managerial subjects blocks *(min. ..... ECTS points):*

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.		**Social competences module**					2		30	60	2	2	1,4	T	Z		DN	P	KO
	PSZ2509S	Business psychology					2	K2_IZ_W12,16 U7,10,11,22,23, K1-5,7	30	60	2	2	1,4	T	Z		DN	P	KO
	PSZ2510S	Leading teams and work groups					2	K2_IZ_W12,16 U7,10,11,22,23 K1-5,7	30	60	2	2	1,4	T	Z		DN	P	KO
2.		Business module	1			1			30	60	2	2	1,4	T	Z		DN	P	KO
	ZMZ2663Wp	Business planning **GK**	1			1		K2_IZ_W6,7,14 U7,10,11,15-17,24,25 K1	30	60	2	2	1,4	T	Z		DN	P	KO
	ZMZ2664Pw	Business models in developing environment **GK**	1			1		K2_IZ_W6,7,14 U10,11,15-18,24,25 K1	30	60	2	2	1,4	T	Z		DN	P	KO
	ZMZ2665Ws	Corporate Social Responsibility **GK**	1				1	K2_IZ_W6,7,14 U10,11,15,16,18,24, 25, K1	30	60	2	2	1,4	T	Z		DN	P	KO
		Total	**1**	**0**	**0**	**1**	**2**		**60**	**120**	**4**	**4**	**2,8**						

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

No.	Course/		Weekly number of hours	Learning effect symbol	Number of hours	Number of ECTS points	Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	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.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
		Total																	

Altogether for general education blocks:

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

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					
1	4	0	1	2	120	210	7	4	4,8

4.2.2 List of basic sciences blocks

4.2.2.1 *Mathematics* block *(min. .... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

		Total																	

4.2.2.3 *Chemistry* block *(min. .... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	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 ..... block *(min. .... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	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					

4.2.4 List of specialization blocks

4.2.4.1 *Specialization subjects (e.g. whole specialization)* blocks *(min. .... 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2002Wlp	Business intelligence workplace **GK**	1		2	1		K2_IZ_W1-3, 5 K2_IZ_U3,9-11 K2_IZ_K1	60	180	6	6	4,2	w:T/Z l,p:T	Z		DN	P (5)	S

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

2.	MAZ2582Wl	Predictive analytics **GK**	2		2			K2_IZ_W1,4,5 U1,5,8-11,26,K1	60	180	6	6	4,2	w:T/Z l:T	E (lec)		DN	P (3)	S
3.	IZZ2005Lw	Visual analytics **GK**	1		1			K2_IZ_W1-4 U1,2,3,9-11, K1	30	90	3	3	2,1	w:T/Z l:T	Z		DN	P (2)	S
4.	IZZ2006Lw	Web scraping and analysis **GK**	1		1			K2_IZ_W2 U2,6,7,10,11, K1	30	90	3	3	2,1	w:T/Z l:T	Z		DN	P (2)	S
5.	MAZ2583W	Prescriptive analytics	2					K2_IZ_W1,4,5 U1,4,5,8-11,26, K1	30	60	2	2	1,4	T/Z	Z		DN		S
6.	MAZ2583L	Prescriptive analytics			2			K2_IZ_W1,4,5 U1,4,5,8-11,26, K1	30	90	3	3	2,1	T	Z		DN	P	S
		Total	**7**	**0**	**8**	**1**	**0**		**240**	**690**	**23**	**23**	**16,1**						

4.2.4.2 *Diploma profile* block *(min. 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2008S	Diploma seminar I (BI Day)					1	K2_IZ_U10,11,26 K2_IZ_K1,5,6,7	15	30	1	1	0,7	T	Z		DN	P	S
2.	IZZ2009S	Diploma seminar II					1	K2_IZ_U10,11,26 K2_IZ_K1,6,7	15	60	2	2	1,4	T	Z		DN	P	S
3.	IZZ2010D	MSc Thesis				4		K2_IZ_U10,11,26 K2_IZ_K1,6,7	60	450	15	15	10,5	T/Z	Z		DN	P	S
		Total	**0**	**0**	**0**	**4**	**2**		**90**	**540**	**18**	**18**	**12,6**						

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					

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

7	0	8	5	2	330	1230	41	41	28,7

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	1 2 15	IZZ2008S Diploma seminar I (BI Day) IZZ2009S Diploma seminar II IZZ2010D MSc Thesis
Character of diploma dissertation		
Literature survey, project, computer program, etc.		
Number of BU[1] ECTS points	12,6	

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

5. Ways of verifying assumed learning outcomes

Type of classes	Ways of verifying assumed learning outcomes
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. 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

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

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. Random variables and their distributions
   7.1. Name and describe the main measures which describe the distribution of a random variable.
8. Linear relationship between variables
   8.1. What is a linear regression and how can you estimate it?
9. Nonlinear relationship between variables
   9.1. 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

10. Descriptive analytics - data visualization tools
    10.1. 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.
11. Predictive analytics tools and models
    11.1. 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

12. Phases of the business cycle
    12.1. List and characterize the phases of the business cycle (4 phases).
13. Market structures
    13.1. List the basic structures of the market and characterize one.

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

Contemporary management

14. New business models and organizational designs
    14.1. Describe a virtual organization. Give an example.
15. Leadership and decision making
    15.1. What are the differences between leadership and management?

Digital marketing and social media

16. Search Engine Optimization (SEO) techniques
    16.1. Describe at least 5 things that are crucial for SEO techniques.
17. Social media marketing content
    17.1. Describe the underlying factors that you would consider before designing content for social media marketing.
18. Social media marketing, branding and Public Relations (PR)
    18.1. Describe the differences among the objectives of marketing, branding, and PR through Social Media.

Game and decisions in management

19. Risk and uncertainty modeling in optimization problems
    19.1. What are risk measures? Give examples of risk measures with their interpretations.
20. Non-cooperative games
    20.1. Describe the concept of equilibrium in non-cooperative games.
21. Cooperative games
    21.1. Describe solution concepts of cooperative games.

Predictive analytics

22. Regression vs neural networks
    22.1. Describe the similarities and differences between regression and neural network models (linearity, training, stability of forecasts, computational time).
23. Point and probabilistic forecasts
    23.1. Describe the concept of quantile regression and quantile regression averaging (QRA).

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

Visual analytics

24. Application of statistical methods in the visualization and analysis of business data.
    - 24.1. Give examples of statistical methods used in data visualization. Describe the concept of one of them.
    - 24.2. What is the trend line used for in the visualization and analysis of business data? Provide examples and interpretation.
25. Application of cluster analysis and decision trees algorithms in visualization to support managerial decisions.
    - 25.1. Give examples of cluster analysis algorithms that are used in data visualization and analysis. Describe the concept of one of them.
    - 25.2. What are the decision trees used for data visualization and analysis, and what is their interpretation?

Web scraping and analysis

26. Methods of web scraping
    - 26.1. What is HTML parsing and what tools will you use in this regard?
    - 26.2. Explain what is data extraction via API? Point out its pros and cons.

Project management

27. Time management of project implementation
    - 27.1. Discuss the Earned Value Method (EVM) for project control.
28. Project stakeholders management
    - 28.1. Discuss at least three ways to classify project stakeholders and at least three types of project stakeholder management activities.
29. Project metrics
    - 29.1. 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

30. Cloud services for business - applications, advantages, disadvantages, and security
    - 30.1. What are the features and business applications of Microsoft cloud services?
    - 30.2. What are the features and business applications of Google cloud services?

Prescriptive analytics

31. Decision making: methods to evaluate alternatives

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]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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31.1. Describe the differences among the main Multi-Criteria Decision Making methods.

32. Decision making: efficiency assessment

32.1. Describe three scalarizing functions that can be used in Multi-objective Mathematical Programming.

33. Decision making: building composite indicators

33.1. Describe the methods that can be used to build composite indices.

Business module

34. The role of planning in an organization

34.1. Explain why proper planning in an organization is crucial for its success.

35. Sustainable development of an organization - methods, values

35.1. How to develop a sustainable system for an organization?

Social competences module

Business psychology

37.A. Psychology of leadership

37.1.A. What factors determine a successful relationship between the leader and employees?

38.A. Psychology at work

38.1.A. Provide three main sources of occupational stress along with an argument why you chose these sources of stress.

Leading teams and work groups

37.B. Emergence, development, and leadership of teams

37.1.B. Briefly present team processes of the 2 most innovative teams of the world.

38.B. Managing diversity, conflict resolution, team reconstruction; performance appraisal of a team and individual team members

38.1.B. What are the main obstacles to communicate effectively in culturally diverse teams?

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

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

No.	*Course / group of courses code*	*Name of course / group of courses*	*Crediting by deadline of... (number of semester)*

8. Plan of studies (attachment no. 3)

Approved by faculty student government legislative body:

18.10.2021 ..... Maciej Bartosik .....

Date — name and surname, signature of student representative

19.10.2021 .....

Date

.....DZIEKAN.....

Dean's signature

dr hab. inż. Katarzyna Tworek, prof. uczelni
(1)

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[MS4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

Zał. nr 4 do ZW 16/2020
Attachment no. 3. to the Program of Studies

PLAN OF STUDIES

FACULTY: Faculty of Management

MAIN FIELD OF STUDY: Business Engineering

EDUCATION LEVEL: second-level studies

FORM OF STUDIES: full-time studies

PROFILE: general academic

SPECIALIZATION: Business Intelligence

LANGUAGE OF STUDY: English

In effect since educational cycle 2021/2022

Plan of studies structure (optionally)

1) in ECTS point layout

23		Foreign language (B2+) (1)		23
22		Diploma seminar I (BI Day) (1)		22
21		Diploma seminar II (2)		21
20	Physics of complex systems (4)	Games and decisions in management (4)		20
19				19
18	Descriptive analytics (7)			18
17			Foreign language (A1 or A2) (2)	17
16		Digital marketing and social media (4)		16
15				15
14	Business simulations (6)		MsC Thesis (15)	14
13				13
12		Project management (6)		12
11				11
10	Creative and design thinking workshop (2)		Business module (2)	10
9				9
8	Contemporary management (2)	Visual analytics (3)	Social competences module (2)	8
7				7
6	Contemporary economics (3)	Web scraping and analysis (3)	Cloud computing services (4)	6
5				5
4	Business intelligence workplace (6)	Predictive analytics (6)	Prescriptive analytics (5)	4
3				3
2				2

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

1				1

2) in hourly layout

23		Foreign language (B2+) (01000)		23
22		Diploma seminar I (BI Day) (00001)		22
21		Diploma seminar II (00001)		21
20	Physics of complex systems (10100)	Games and decisions in management (20200)		20
19				19
18	Descriptive analytics (20200)			18
17			Foreign language (A1 or A2) (03000)	17
16		Digital marketing and social media (10210)		16
15				15
14	Business simulations (10210)		MsC Thesis (00040)	14
13				13
12		Project management (10210)		12
11				11
10	Creative and design thinking workshop (00020)		Business module (10010)	10
9				9
8	Contemporary management (00002)	Visual analytics (10100)	Social competences module (00002)	8
7				7
6	Contemporary economics (10010)	Web scraping and analysis (10100)	Cloud computing services (00101)	6
5				5
4	Business intelligence workplace (10210)	Predictive analytics (20200)	Prescriptive analytics (20200)	4
3				3

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

2				2
1				1

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

Semester 1

Obligatory courses / groups of courses **Number of ECTS points 24**

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2000P	Creative and design thinking workshop					2	K2_IZ_W9 U10,11,18,22,23 K1-7	30	60	2	2	2,1	T	Z		DN	P	K
2.	FZZ2515Wl	Physics of complex systems **GK**	1		1			K2_IZ_W11 U10,11,20,21 K1	30	120	4	4	2,1	lec:T/Z lab:T	Z		DN	P (2)	PD
3.	IZZ2001Lw	Business simulations **GK**	1		2			K2_IZ_W1 U1,4,5,10,11, K1	45	150	5	5	3,5	lec:T/Z lab:T	Z		DN	P(3)	K
4.	IZZ2001P	Business simulations				1		K2_IZ_W1 U1,4,5,10,11, K1	15	30	1	1	0,7	T	Z		DN	P	K
5.	MAZ2581W	Descriptive analytics	2					K2_IZ_W2,4,5 U2,8-11, K1	30	120	4	4	2,8	T/Z	E		DN		PD
6.	MAZ2581L	Descriptive analytics			2			K2_IZ_W2,4,5 U2,8-11, K1	30	90	3	3	2,1	T	Z		DN	P	PD
7.	EKZ2506Sw	Contemporary economics **GK**	1				1	K2_IZ_W6,7,9,13,14,U 10,11,15,16,18,24,25, K1	30	90	3	3	2,1	lec:T/Z sem:T	Z		DN	P (1)	K
8.	ZMZ2661S	Contemporary management					2	K2_IZ_W6,7,9,13,14, U10,11,15-18,24,25, K1	30	60	2	2	1,4	T	Z		DN	P	K
		Total	**5**	**0**	**5**	**1**	**3**		**240**	**720**	**24**	**24**	**16,8**						

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

Optional courses / groups of courses (minimum 60 hours in semester, 6 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2002Wlp	Business intelligence workplace **GK**	1		2	1		K2_IZ_W1-3, 5 K2_IZ_U3,9-11 K2_IZ_K1	60	180	6	6	4,2	lec:T/Z lab,pr:T	Z		DN	P (5)	S
		Total	**1**		**2**	**1**			**60**	**180**	**6**	**6**	**4,2**						

Altogether in semester

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					
6	0	7	5	2	300	900	30	30	21,0

Semester 2

Obligatory courses / groups of courses Number of ECTS points 14

No.	Course/	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours	Learning effect symbol	Number of hours	Number of ECTS points	Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	group of courses code		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.	IZZ2003Pwl	Digital marketing and social media **GK**	1		2	1		K2_IZ_W7,9 U10,11,15, K1	60	120	4	4	2,8	lec:T/Z lab,pr:T	Z		DN	P (3)	K
2.	IZZ2004W	Games and decisions in management	2					K2_IZ_W1,4,5,9,10 U1,5,8-11,26, K1	30	60	2	2	1,4	T/Z	Z		DN		K
3.	IZZ2004L	Games and decisions in management			2			K2_IZ_W1,4,5,9,10 U1,5,8-11,26, K1	30	60	2	2	1,4	T	Z		DN	P	K
4.	ZMZ2662W	Project management	1					K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	15	60	2	2	1,4	T/Z	E		DN		K
5.	ZMZ2662L	Project management			2			K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	30	60	2	2	1,4	T	Z		DN	P	K
6.	ZMZ2662P	Project management				1		K2_IZ_W,8-10,15,16 U10, 11, 17, 19, 22, 27, K1	15	60	2	2	1,4	T	Z		DN	P	K
		Total	**4**	**0**	**6**	**2**	**0**		**180**	**420**	**14**	**14**	**9,8**						

Optional courses / groups of courses (minimum 165 hours in semester, 16 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					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	MAZ2582Wl	Predictive analytics **GK**	2		2			K2_IZ_W1,4,5 U1,5,8-11,26,K1	60	180	6	6	4,2	lec:T/Z lab:T	E (lec)		DN	P (3)	S
2.	IZZ2005Lw	Visual analytics **GK**	1		1			K2_IZ_W1-4 U1,2,3,9-11, K1	30	90	3	3	2,1	lec:T/Z lab:T	Z		DN	P (2)	S
3.	IZZ2006Lw	Web scraping and analysis **GK**	1		1			K2_IZ_W2 U2,6,7,10,11, K1	30	90	3	3	2,1	lec:T/Z lab:T	Z		DN	P (2)	S
4.	IZZ2008S	Diploma seminar I (BI Day)					1	K2_IZ_U10,11,26 K2_IZ_K1,5,6,7	15	30	1	1	0,7	T	Z		DN	P	S
5.	IZZ2009S	Diploma seminar II					1	K2_IZ_U10,11,26 K2_IZ_K1,6,7	15	60	2	2	1,4	T	Z		DN	P	S
6.	JZL	Foreign language (B2+)		1				K2_IZ_U10-14 K2_IZ_K1	15	30	1		0,5	T	Z	O		P	KO

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	Total	**4**	**1**	**4**	**0**	**2**		**165**	**480**	**16**	**15**	**11,0**						

Altogether in semester

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					
7	1	11	2	2	345	900	30	29	20,8

Semester 3

Obligatory courses / groups of courses — Number of ECTS points 4

No.	Course/ group of courses code	Name of course/group of courses (denote group of courses with symbol **GK**)	Weekly number of hours					Learning effect symbol	Number of hours		Number of ECTS points			Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses			
			lec	cl	lab	pr	sem		ZZU	CNPS	Total	DN[5] classes	BU[1] classes			University-wide[4]	Concerning scientific activities[5]	Practical[6]	Type[7]
1.	IZZ2007Sl	Cloud computing services **GK**			1		1	K2_IZ_W3 U3,6,10,11, K1	30	120	4	4	2,8	T	Z		DN	P(4)	K
		Total			**1**		**1**		**30**	**120**	**4**	**4**	**2,8**						

Optional courses / groups of courses (minimum 225 hours in semester, 26 ECTS points)

No.	Course/		Weekly number of hours		Number of hours	Number of ECTS points	Form[2] of course/group of courses	Way[3] of crediting	Course/group of courses

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

	group of courses code	Name of course/group of courses (denote group of courses 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]
1.	MAZ2583W	Prescriptive analytics	2					K2_IZ_W1,4,5 U1,4,5,8-11,26, K1	30	60	2	2	1,4	T/Z	Z		DN		S
2.	MAZ2583L	Prescriptive analytics			2			K2_IZ_W1,4,5 U1,4,5,8-11,26, K1	30	90	3	3	2,1	T	Z		DN	P	S
3.	IZZ2010D	MsC Thesis				4		K2_IZ_U10,11,26 K2_IZ_K1,6,7	60	450	15	15	10,5	T	Z		DN	P	S
4.	JZL	Foreign language (A1 or A2)		3				K2_IZ_U10-14 K2_IZ_K1	45	60	2		1,5	T	Z	O		P	KO
5.		**Social competences module**					2		30	60	2	2	1,4	T	Z		DN	P	KO
	PSZ2509S	Business psychology					2	K2_IZ_W12,16 U7,10,11,22,23, K1-5,7	30	60	2	2	1,4	T	Z		DN	P	KO
	PSZ2510S	Leading teams and work groups					2	K2_IZ_W12,16 U7,10,11,22,23 K1-5,7	30	60	2	2	1,4	T	Z		DN	P	KO
6.		Business module	1			1			30	60	2	2	1,4	T	Z		DN	P(1)	KO
	ZMZ2663Wp	Business planning **GK**	1			1		K2_IZ_W6,7,14 U7,10,11,15-17,24,25 K1	30	60	2	2	1,4	lec:T/Z pr:T	Z		DN	P(1)	KO
	ZMZ2664Pw	Business models in developing environment **GK**	1			1		K2_IZ_W6,7,14 U10,11,15-18,24,25 K1	30	60	2	2	1,4	lec:T/Z pr:T	Z		DN	P(1)	KO
	ZMZ2665Ws	Corporate Social Responsibility **GK**	1				1	K2_IZ_W6,7,14 U10,11,15,16,18,24, 25, K1	30	60	2	2	1,4	lec:T/Z sem:T	Z		DN	P(1)	KO
		Total	**3**	**3**	**2**	**5**	**6**		**225**	**780**	**26**	**24**	**18,3**						

Altogether in semester

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					

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

3	3	3	5	3	255	900	30	28	21,1

2. Set of examinations in semestral arrangement

Course / group of courses code	Names of courses / groups of courses ending with examination	Semester
MAZ2581W	1.Descriptive analytics	1
MAZ2582Wl ZMZ2662W	1. Predictive analytics **GK** 2. Project management	2

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

Semester	Allowable deficit of ECTS points after semester
1	12
2	12
3	0

Opinion of student government legislative body

19.10.2021 ..... Maciej Bartak Bartak

Date Name and surname, signature of student representative

19.10.2021 ..... DZIEKAN .....

Date Dean's signature

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

[1]BU – number of ECTS points assigned to hours of classes requiring direct participation of academic teachers and other persons conducting classes
[2]Traditional – enter T, remote – enter Z
[3]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)
[4]University-wide course /group of courses – enter O
[5]DN - 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
[6]Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses
[7]KO – general education courses, PD – basic sciences courses, K – main field of study courses, S – specialization courses

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Współczesne problemy ekonomii
Name of subject in English: Contemporary economics
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time studies
Kind of subject: obligatory
Subject code EKZ2506
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**				**15**
Number of hours of total student workload (CNPS)	**30**				**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					**X**
Number of ECTS points					**3**
including number of ECTS points for practical classes (P)					**1**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**2,1**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. No requirements

SUBJECT OBJECTIVES

C1- The ability to identify and analyze factors influencing economic choices at the microeconomic level.
C2- Understanding macroeconomic processes in the context of economic growth and development.

SUBJECT EDUCATIONAL EFFECTS

The scope of knowledge:

PEU_W01 Students knows the place of economics in the sciences, and of the substantive and methodological links with other scientific disciplines. The student understands the basic macroeconomic theories.

PEU_W02 Students knows the circumstances and depending on macroeconomic growth and development of the national economy and the world. Knows the basic economic tools and regulations on the national economy, the economies of integration groups globally.

The range of skills:

PEU_U01 Student understands and is able to use theoretical knowledge in economics and related disciplines to analyze and interpret problems in macroeconomic management.

PEU_U02 Student has the ability to identify, understand and analyze the macroeconomic factors in the context of the policy as part of the macroeconomic and business environment.

The scope of social competence:

PEU_K01Student can discuss possible solutions to the practical functioning of the economy at the macroeconomic level, to justify the view presented by analyzing the benefits and risks of particular solutions.

PROGRAMME CONTENT

	Lecture	**Number of hours**
Lec 1	Introduction. Basics of economics	**2**
Lec 2	Market law of supply and demand, price elasticity of demand, applications	**2**
Lec 3	Behavior of companies- production costs	**2**
Lec 4	Market structures	**2**
Lec 5	Measures of economic activity. Business cycle	**2**
Lec 6	Money and inflation	**2**
Lec7,Lec8	Labor market and unemployment	**3**
	Total hours	**15**

	Project	**Number of hours**
Proj 1	Introduction. Assessment criteria	**2**
Proj 2	Market law of supply and demand, price elasticity of demand, applications.	**2**
Proj 3	Behavior of companies- production costs	**2**
Proj 4	Market structures	**2**
Proj 5	Measures of economic activity. Business cycle	**2**
Proj 6	Money and inflation	**2**
Proj 7	Labor market and unemployment	**2**
Proj 8	Issuing grades	**1**
	Total hours	**15**

TEACHING TOOLS USED

N1. Lecture with the use of a multimedia presentation
N2. Quizzes, surveys, group work ending with the presentation of the results

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 PEU_W02 PEU_U01 PEU_U02 PEU_K01	Presentation on a selected micro- and macroeconomic issue
F2	PEU_W01 PEU_W02 PEU_U01 PEU_U02 PEU_K01	Conducting discussions and debates
P = 0,5*F1 + 0,5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] "Principles of Macroeconomics" G. Mankiw, R.Kneenone, K.McKenzie, 2020, 8th edition, Publisher: Nelson Education

[2] "Microeconomics" G. Mankiw, M.Taylor, 2020, 5th edition, Publisher: Cengage

SECONDARY LITERATURE:

[3] "Basic economics: A common Sense Guide to the Economy" T. Sowell, 2007, 5th edition, Publisher: Basic Books

[4] "Economics" P. Krugman, R.Wells, 2018, 5th edition, Worth Publishers

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Joanna.Kott@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Fizyka układów złożonych
Name of subject in English: Physics of complex systems
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level full-time
Kind of subject: obligatory
Subject code FZZ2515
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**15**		
Number of hours of total student workload (CNPS)	**60**		**60**		
Form of crediting	**crediting with grade**				
For group of courses mark (X) final course	**X**				
Number of ECTS points	**4**				
including number of ECTS points for practical classes (P)			**2**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**2,1**				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Programming skills for example in Python
2. Knowledge of elements of physics, probability and statistics, and skills related to this subject

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SUBJECT OBJECTIVES

C1 The purpose of this introductory course is to give an overview of the basic concepts, models and tools, used in the field of the Complex Systems, i.e. systems of many interacting components. After this course students should understand the essence of complexity and relations between different approaches used for complex systems.

SUBJECT EDUCATIONAL EFFECTS

Related to knowledge:

PEU_W01: He knows and understands advanced models, methods and IT tools, especially simulation tools used to solve management decision-making problems.

In the field of skills:
PEU_U01: Can describe selected issues encountered in everyday and professional life using mathematical and physical formalism and draw conclusions

In the field of social competences:
PEU_K01: Is able to take an active part in discussions and work in a group

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Presentation of the requirements and grading. Introduction: what is a Complex system and how it can be modeled?	1
Lec 2	Percolation model	2
Lec 3	Ising Model	2
Lec 4	Complex networks: models and processes on networks	2
Lec 5	Modeling the spreading of rumor, opinion etc. in a network (Ising model on a network, q-voter model)	2
Lec 6	Elements of phase transitions theory	2
Lec 7	Network coevolution – network evolves due to interactions	2
Lec 8	Final test	2
	Total hours	15

Laboratory		**Number of hours**
Lab 1	Presentation of the requirements and grading.	1
Lab 2	Simulation of the Percolation model	3
Lab 3	Metropolis Monte Carlo simulation of the Ising model	3
Lab 4	Complex networks: models and visualization (NetworkX package for Python)	2
Lab 5	Simulation and analysis of processes on networks (resistance to errors, attacks)	3
Lab 6	Modeling the spreading of rumor, opinion etc. in a network (Ising model on a network	3
	Total hours	15

TEACHING TOOLS USED
N1. Traditional lecture N2. Multimedia presentation N3. Computer laboratory – PC computer with Python.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_U01	The final grade from the test (lecture)
F2	PEU_W01, PEU_U01 PEU_K01	The average grade from labs
P=0,5*F1+0,5*F2		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: 1.Albert-László Barabási, "Network Science", Cambridge University Press 2016 2. Nino Boccara, "Modeling Complex Systems", 2nd Edition, Springer-Verlag New York Inc. 2010 3. Nicholas R. Moloney, Kim Christensen, "Complexity and Criticality", Imperial College Press 2005 **SECONDARY LITERATURE:** 1. David P. Landau, Kurt Binder, "A Guide to Monte Carlo Simulations in Statistical Physics", 4th Edition, Cambridge University Press 2014 2. Mark Newman, "Networks: An Introduction", Oxford University Press 2010 3. Stefan Thurner, Rudolf Hanel, and Peter Klimek, "Introduction to the Theory of Complex Systems", Oxford University Press 2018 4. Mark E. J. Newman, G. T. Barkema, "Monte Carlo Methods in Statistical Physics", Oxford University Press 1999
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
Michał Jarema, michal.jarema@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Praca dyplomowa
Name of subject in English: MSc Thesis
Main field of study: Business Engineering
Specialization: Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2010D
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**60**
Number of hours of total student workload (CNPS)					**450**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**15**
including number of ECTS points for practical classes (P)					**15**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**10,5**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1 Cross-cutting knowledge of issues in the course of study

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SUBJECT OBJECTIVES

C1 To synthesize knowledge from the entire course of study and practical skills, especially in the field of the selected specialization.
C2 To consolidate skills of acquiring and using scientific and technical information.
C3 To achieve proficiency in diagnosing management systems and designing solutions to managerial problems.
C4 To develop in a compact form a work (diploma thesis) on the basis of knowledge gained during studies, literature information, analytical and design work, including the results of research work.

SUBJECT EDUCATIONAL EFFECTS

relating to skills:

PEU_U01 Is able to make in-depth analysis of working or designed process in organization or phenomena and systems in the field of management and indicate dysfunctions and/or needs for improvement.
PEU_U02 Can gather and analyze information from various sources in the field of management.
PEU_U03 Can correctly indicate, select and apply basic methods, techniques and tools to solve a managerial problem.
PEU_U04 Can correctly identify a managerial problem and solve it using appropriate methods, techniques and tools.

PEU_U05 Can prepare a professional work - a comprehensive text presenting in a rigorous way the results of analytical, design and research work.

PROGRAMME CONTENT

	Project	Number of hours
Sem1	Analysis of the organization (or phenomenon, system) that is the subject of the paper. Identification, analysis of the problem and assumptions, research theses.	8
Sem 2	In-depth literature analysis of issues addressed in the thesis, including methods, techniques, and tools used to solve problems of a particular class.	8
Sem 3	Analytical and research work.	24
Sem 4	The analysis of the results obtained, of the feasibility and desirability of their implementation, of the schedule, of the expected effects and economics.	4
Sem 5	To determine the direction of future work on the issue included in the scope of the thesis.	4
Sem 6	Thesis Editing	12
	Total hours	60

TEACHING TOOLS USED

N1. Literature study.
N2. Interviews with employees of the organization that is the subject of the study.
N3. Research methods appropriate to the topic of the work, e.g. surveys.
N4. Own analytical and creative work.
N5. Individual consultations.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_U01-PEU-U05	Ongoing evaluation of systematic work and partial performance.
F2	PEU_U01-PEU-U05	Final evaluation of the finished work (thesis).
P = 0,5*F1 + 0,5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

Literature related to the problems of the thesis - independently selected and recommended by the thesis supervisor.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Name.ForenameOfSupervisor@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Warsztat kreatywnego myślenia
Name of subject in English: Creative and design thinking workshop
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd levels tudies, full-time
Kind of subject: obligatory
Subject code: IZZ2000
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**30**
Number of hours of total student workload (CNPS)					**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**2**
including number of ECTS points for practical classes (P)					**2**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**2,1**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

There are no mandatory pre-requisites to attend this course

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SUBJECT OBJECTIVES

C1 To expose students to the design process as a tool for innovation.
C2 To make students understand design thinking and its five steps.
C3 To acquire knowledge about the various tools, techniques and templates used in design thinking.
C4 To apply the tools taught onto real life environment and situations
C5 To provide an authentic opportunity for students to develop teamwork and leadership skills.
C6 To achieve innovative results.

SUBJECT EDUCATIONAL EFFECTS

Relating to Knowledge:

PEU_W01: Describes multidisciplinary approach to innovation as a powerful way to incorporate the perspectives of many kinds of people.

PEU_W02: Knows to approach innovation challenges from a human-centered perspective.

PEU_W03: Knows implementation of each step of design thinking process and ideation techniques, to achieve innovative results.
PEU_W04: Knows the Sustainable Development Goals and all targets.

Relating to skill:

PEU_U01: Able to define and re-define innovation challenges by asking the right questions, and not necessarily focusing on the right answers but applying lateral and divergent thinking.
PEU_U02: Able to apply design thinking in wide range of context, from personal to global.
PEU_U03: Able to investigate about design problems and opportunities.
PEU_U04: Able to visually and articulacy explain design and prototyping.

Relating to social competences:

PEU_K01: Is oriented to problem identification and creative problem solving.
PEU_K02: Can effectively collaborate with different people in fast-paced, dynamic, cross-disciplinary team settings.
PEU_K03: Gain a greater acceptance towards dealing with ambiguity and uncertainty in their professional and personal lives.
PEU_K04: Competence to approach many different problems and challenges with an open, creative, empathetic, and prototype-driven mind set.
PEU_K05: Increased confidence in creative abilities.

PROGRAMME CONTENT		
Seminar		**No. Of hours**
Sem 1	Pre-course evaluation and Ice Breaker	2
Sem 2	Discussion on Creativity and Teamwork	2
Sem 3	Sustainable Development Goals and effects of our actions	2
Sem 4	Discussion on Design Thinking for Problem Solving & case studies	2
Sem 5		2
Sem 6	Creative Thinking, introduction of SCAMPER, explanation to use of trigger questions and trigger words for SCAMPER	2
Sem 7		2
Sem 8	Pitching Idea and Team Formation	2
Sem 9	Preparing criteria for formulation of problem statement and defining the problem statement	2
Sem 10	Empathize: Observe, record and find the users' need	2
Sem 11	Define: State you users' needs and problems	2
Sem 12	Ideate: use SCAMPER to develop ideas for solving users' problems and cater to their needs	2
Sem 13	Prototyping solution – Mock-ups, Storyboards, Iterations	2
Sem 14	Testing prototype – field feedback and 2nd Iteration	2

Sem 15	Presentation of final solutions	2
	Total hours	30

TEACHING TOOLS USED
N1 Lecture information N2 Multimedia presentation N3 Flipped classroom N4 Demonstrations N5 Collaboration and group discussion using MS Teams or Slack or similar softward/web-platform N6 Documentation and debriefing N7 Group feedback

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_K02, PEU_K03, PEU_K04, PEU_K05	Group work during the semester
F2	PEU_U01, PEU_U02, PEU_U03, PEU_U04, PEU_K01	Team presentation
F3	PEU_W01, PEU_W02, PEU_W03, PEU_W04, PEU_K01	Individual course journal
P = F1 * 20% + F2 * 40% + F3 * 40% To pass the course a student is required to collect at least 50% in each F1, F2 and F3 respectively (3.5 from 55%, 4.0 from 65%, 4.5 from 75%, 5.0 from 85%, 5.5 from 95%)		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. Plattner, H., Leifer, L., Meinel, C. (2011). Design Thinking – Understand, Improve, Apply, Springer, Berlin, Heidelberg.
2. Darbellay, F., Moody, Z., Lubart, T. (2017). Creativity, Design Thinking and Interdisciplinarity, Springer, Singapore.
3. Bernhard, S. (2016). Simply Brilliant: Powerful Techniques to Unlock Your Creativity and Spark New Ideas, New York: AMACOM.

SECONDARY LITERATURE:

1. Luchs, M., Griffin, A., Swan, S. (2015). Design Thinking, Wiley-Blackwell.
2. Macanufo, J., Brown, S., Gray, D. (2010). Gamestroming, Sebastopol: O'Reilly Media, Incorporated.
3. Mootee, I. (2013). Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School, John Wiley & Sons.
4. Kelley, D. & Kelley, T. (2014). Creative Confidence: Unleashing the Creative Potential Within Us All, New York: William Collins.
5. Roth, B. (2015). The Achievement Habit: Stop Wishing, Start Doing, and Take Command of Your Life, Harper Business.
6. Roger, M. (2013). The Design of Business: Why Design Thinking is the Next Competitive Advantage, Boston: Harvard Business Review Press.
7. Follett, J. (2016). What is Design Thinking ?, O'Reilly [Online], https://www.oreilly.com/ideas/what-is-design-thinking, (Last Accessed – 25th April 2019).

8. VII) Levy, M. (2017) Design Thinking in Multidisciplinary Learning Teams: Insights from Multidisciplinary Teaching Events. In: Metzger, A., Persson, A. (eds) Advanced
9. Information Systems Engineering Workshops. CAiSE 2017. Lecture Notes in Business Information Processing, vol 286. Springer, Cham.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Symulacje w biznesie
Name of subject in English: Business simulation
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level full-time
Kind of subject: obligatory
Subject code IZZ2001
Group of courses YES – lecture, laboratory; NO - project

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**30**	**15**	
Number of hours of total student workload (CNPS)	**60**		**90**	**30**	
Form of crediting			**crediting with grade**	**crediting with grade**	
For group of courses mark final course with (X)			**X**		
Number of ECTS points			**5**	**1**	
including number of ECTS points for practical classes (P)			**3**	**1**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)			**3,5**	**0,7**	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Ability to model in an Excel spreadsheet
2. Basic knowledge of probability theory and mathematical statistics
3. Knowledge of basic concepts of simulation modeling

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SUBJECT OBJECTIVES

C1 - To familiarize students with the principles of building simulation models, in particular Monte Carlo, discrete event and agent-based models
C2– Developing skills in using simulation models to describe the current state and forecast future states of organizations
C3 - To develop skills in solving complex management decision problems using computer simulation experiments

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01. Knows advanced methods and computer simulation tools for identifying and modeling complex management decision-making processes. Has in-depth knowledge of selected simulation methods supporting decision making in a variable or uncertain environment.

relating to skills:

PEU_U01. Can choose the right simulation method and build a simulation model. Can plan and carry out computer simulation experiments. Is able to use simulation models in solving complex management decision problems

relating to social competences:

PEU_K01 Understand the essence of business ethics

PEU_K02 Is able to cooperate and work in groups and teams

PROGRAM CONTENT		
Lectures		**Number of hours**
Lec 1	Presentation of the requirements and grading. Introduction to simulation modeling. Definitions and concepts. Review of management simulation methods.	1
Lec 2	The framework of the simulation study. Monte Carlo method. Sampling methods.	2
Lec 3	Discrete event simulation – process modeling	2
Lec 4	Discrete event simulation – process modeling	2
Lec 5	Application of agent-based modeling in social sciences	2
Lec 6	Agent-based modeling – model of segregation	2
Lec 7	Agent-based modeling – model of innovation diffusion	2
Lec 8	Agent-based modeling – model of spreading disease	2
	Total hours	**15**

Laboratory		**Number of hours**
Lab 1	Requirements and grading. Objectives of the subject. Simple Monte Carlo (MC) simulations	2
Lab 2	MC model: discrete and continuous distributions. Case no 1	2
Lab 3	MC Model: project management. Case no 2	2
Lab 4	Discrete event simulation. Introduction	2
Lab 5	Discrete event simulation. Case no 3	2
Lab 6	Discrete event simulation. Case no 4	2
Lab 7	Discrete event simulation. Case no 5	2
Lab 8	DES model defense and presentation	2
Lab 9	Introduction to NetLogo - commands and procedures	2

Lab 10	Analysis of examples in the NetLogo Models Library – part 1	2
Lab 11	Analysis of examples in the NetLogo Models Library – part 2	2
Lab 12	Model development cycle in Netlogo	2
Lab 13	Sheep and wolves example	2
Lab 14	Usage of behavior space	2
Lab15	Final report	2
	Total hours	30

Project		**Number of hours**
P1	Presentation of the requirements and grading	1
P 2	Review of a chosen model	2
P 3	Choosing a model to modify; Model modification	2
P4	Development of own model, part 1	2
P5	Development of own model, part 2	2
P6	Development of own model, part 3	2
P7	Evaluation of the author's model	2
P8	Evaluation of the author's model	2
	Total hours	

TEACHING TOOLS USED
N1. Multimedia presentation N2. NetLogo N3. Microsoft Excel spreadsheet N4. Arena Rockwell Software

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_U01 PEU_K01 PEU_K02	Task 1 (Models MC)
F2	PEU_U01 PEU_K01 PEU_K02	Task 2 (Models DES)
F3	PEU_U01 PEU_K01 PEU_K02	Task 3 (ABM models)
F4	PEU_U01	Task 4 (Project)

	PEU_K01 PEU_K02	
F5	PEU_W01	Mini tests
P (lecture) = P(lab) P (lab) = 0,3*presence+0.7* average(F1,F2,F3,F5) P (project) = F4		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Law A., Kelton W.D., *Simulation modeling and analysis*, McGraw Hill Higher Education 2007
[2] Winston L.W., *Microsoft Excel 2019 Data Analysis and Business Modeling.* Microsoft Press US, 2019
[3] Wilensky U., Rand W. Natural, Social, and Engineered Complex Systems with NetLogo, The MIT Press, 2015

SECONDARY LITERATURE:

[1] Mielczarek B., *Modelowanie symulacyjne w zarządzaniu. Symulacja dyskre*tna. Oficyna Wydawnicza PWr Wrocław 2009
[2] Hamill, L., Gilbert, N. Agent-Based Modelling in Economics, 2016 John Wiley & Sons, Ltd.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Pracownia Inteligencji Biznesowej
Name of subject in English: Business Intelligence Workplace
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2002
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**30**	**15**	
Number of hours of total student workload (CNPS)	**60**		**90**	**30**	
Form of crediting	**Crediting with grade**				
For group of courses mark (X) final course	**X**				
Number of ECTS points	**6**				
including number of ECTS points for practical classes (P)			**3**	**2**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**4,2**				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Basic computer programming skills (e.g., C ++, Excel / VBA, Matlab, Netlogo, Python) and understanding of fundamental statistical methods.

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SUBJECT OBJECTIVES

C1 Mastering programming skills useful for business intelligence applications.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Knows computational environments (MATLAB/Octave, Python and R) useful for business intelligence applications.
PEU_W02 Knows the basic and selected advanced modeling and forecasting tools and knows how to use them for descriptive, predictive and prescriptive analytics.

relating to skills:
PEU_U01 Is able to use selected computational environments to perform specific business intelligence tasks.

PEU_U02 Is able to implement simple and apply selected advanced modeling and forecasting techniques.

relating to social competences:
PEU_K01 Is aware of the need for independent, critical assessment of the scope and level of knowledge in the field of business intelligence. Is prepared to independently search for knowledge in this area.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1-2	Introduction to the Business Intelligence Workplace – basics of MATLAB/Octave, Python and R environments	2
Lec 3-5	Descriptive analytics module: data management, interoperability between the frameworks, visualization techniques, dashboards	3
Lec 6-7	Predictive analytics module: modeling and clustering	2
Lec 8-10	Predictive analytics module: classification tasks using convolutional neural networks and random forests	3
Lec 11-12	Predictive analytics module: non-linear regression forecasting using neural networks	2
Lec 13-15	Prescriptive analytics module: simulation, optimization	3
	Total hours	15

Laboratory		**Number of hours**
Labs 1-2	Introduction to the Business Intelligence Workplace – basics of MATLAB/Octave, Python and R environments	4
Labs 3-5	Descriptive analytics module: data management, interoperability between the frameworks, visualization techniques, dashboards	6
Lab 6-7	Predictive analytics module: modeling and clustering	4
Labs 8-10	Predictive analytics module: classification tasks using convolutional neural networks and random forests	6
Labs 11-12	Predictive analytics module: non-linear regression forecasting using neural networks	4
Labs 13-15	Prescriptive analytics module: simulation, optimization	6
	Total hours	30

Project		**Number of hours**
Proj 1-4	Descriptive analytics project in R	4
Proj 5-11	Predictive analytics project in Python	7
Proj 12-15	Prescriptive analytics project in MATLAB/Octave	4
	Total hours	15

TEACHING TOOLS USED
N1. Multimedia presentations (lectures). N2. Computational tasks in MATLAB/Octave, Python, R (computer lab). N3. Case studies (projects).

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_W02	Based on project reports
F2	PEU_U01, PEU_U02, PEU_K01	Project reports
F3	PEU_U01, PEU_U02, PEU_K01	Lab tasks
P = F1+F2+F3 - computed in percentage points (%), transformed into the scale 2-5.5		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Camm, J. D., Cochran, J. J, Fry, M. J., Ohlmann, J. W., Anderson, D. R., Sweeney, D. J. & Williams, T. A. (2019) Business analytics. Cengage. [2] Vercellis, C. (2009) Business intelligence: data mining and optimization for decision making. Wiley. **SECONDARY LITERATURE:** [1] Sharda, R., Delen, D. & Turban, E. (2020). Analytics, Data Science & Artificial Intelligence: Systems for decision support. Pearson. [2] Ferrari, A., Russo, M. (2016) Introducing Microsoft Power BI. Microsoft Press.
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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish Marketing cyfrowy i media społecznościowe
Name of subject in English: Digital Marketing and Social Media
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level studies, full-time
Kind of subject: obligatory
Subject code: IZZ2003
Group of courses: Yes

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**30**	**15**	
Number of hours of total student workload (CNPS)	**30**		**30**	**60**	
Form of crediting	**crediting with grade**		**crediting with grade**	**crediting with grade**	
For group of courses mark (X) final course				**X**	
Number of ECTS points				**4**	
including number of ECTS points for practical classes (P)			**1**	**2**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)				**2,8**	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has basic knowledge of using computer and internet applications.
2. Student has profiles on various social media platforms such as Facebook, LinkedIn, Twitter, Instagram (optional)

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SUBJECT OBJECTIVES

C1 To provide students with an understanding of the strategic and tactical issues of digital marketing and social media.
C2 To equip students with professional, intellectual and key transferable skills consistent with professional standards in online marketing.
C3 To equip students with the ability to learn and work autonomously in the pursuit of creative and digital strategies and business solutions.

SUBJECT EDUCATIONAL EFFECTS

Relating to Knowldege:

PEU_W01: Relevant knowledge of digital marketing and social media, its associated technologies, its management, and the ecosystem in which it is applied and managed.

PEU_W02: Understanding of tools and techniques which are sufficient to allow comprehensive investigation into relevant digital marketing and social media related issues.

Relating to skill:

PEU_U01: Ability to make effective use of digital and social media for business marketing.

PEU_U02: Ability to adapt and demonstrate originality, insight and critical and reflective skills so as to make informed decisions in dynamic online environment.

PEU_U03: Ability to communicate effectively both orally and in writing, using a range of media

PROGRAMME CONTENT

Lecture		**No. Of hours**
Lec 1	Introduction to the course, requirements, and evaluation	1
Lec 2	Landscape of digital marketing and social media	2
Lec 3	Digital marketing strategies and campaigns	2
Lec 4	Digital media and marketing mix	2
Lec 5	Search Engine Optimization and Search Engine Marketing	2
Lec 6	Social media marketing and relationship marketing using digital platforms	2
Lec 7	Social media marketing strategy	2
Lec 8	Social media analytics	2
	Total hours	15

Laboratory		**No. Of Hours**
Lab 1	Laboratory rules, regulations and introduction to platforms to be used	1
Lab 2	Acquainting with digital marketing and social media platforms	2
Lab 3	Creating digital marketing strategies and campaigns	2
Lab 4		2
Lab 5	Google Analytics and Advertising	2
Lab 6	Creating social media marketing strategies and campaigns	2
Lab 7	Creating content for digital and social media	2
Lab 8		2
Total hours	**15**	

Project		**No. Of Hours**
Proj 1	Discussion on the project outline and selecting a business (real or imaginary)	2

Proj 2	Creating a comprehensive digital marketing strategy	10
Proj 3	Creating a comprehensive social media marketing strategy	10
Proj 4	Creating content for implementation of the strategies	6
Proj 5	Final presentations and group discussion **Total hours**	2 **30**

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

TEACHING TOOLS USED

N1 Lecture information
N2 Multimedia presentation
N3 Flipped classroom
N4 Demonstrations
N5 Collaboration and group discussion
N6 Team work on Microsoft Teams or similar team work software/web-platform
N7 Documentation and debriefing
N8 Group feedback

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_W02	Lab Tasks
F2	PEU_W01, PEU_W02, PEU_U01, PEU_U02, PEU_U03	Final Report & Presentation

P = F1 * 30% + F2 * 70%
To pass the course a student is required to collect at least 50% in each F1 and F2 respectively.
(3 from 50%, 3.5 from 60%, 4.0 from 70%, 4.5 from 80%, 5.0 from 90%, 5.5 from 99%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

i) Chaffey, Dave, and Fiona Ellis-Chadwick. Digital marketing. Pearson UK, 2019.
ii) Tuten, Tracy L. Social media marketing. Sage, 2020.

SECONDARY LITERATURE:

i) Hanlon, Annmarie. Digital marketing: Strategic planning & integration. Sage, 2018.
ii) West, Douglas C., John Battice Ford, and Essam Ibrahim. Strategic marketing: creating competitive advantage. Oxford University Press, USA, 2015.
iii) Heinze, Aleksej, et al., eds. Digital and social media marketing: a results-driven approach. Routledge, 2020.
iv) Chawla, Yash, and Grzegorz Chodak. Social media marketing for businesses: organic promotions of web-links on Facebook. Journal of Business Research. 2021, vol. 135, pp. 49-65. https://dx.doi.org/10.1016/j.jbusres.2021.06.020

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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Gry i decyzje w zarządzaniu
Name of subject in English: Games and decisions in management
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code: IZZ2004
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**30**		**30**		
Number of hours of total student workload (CNPS)	**60**		**60**		
Form of crediting	**Crediting with grade**		**Crediting with grade**		
For group of courses mark (X) final course					
Number of ECTS points	**2**		**2**		
including number of ECTS points for practical classes (P)			**2**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**1,4**		**1,4**		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of probability calculus
2. Basic skills in computer programming

SUBJECT OBJECTIVES

C1 Presenting various decision-making models, involving one or more persons, under risk or uncertainty.
C2 Showing applications of decision theory and game theory in management.
C3 Presenting methods of computing solutions to various decision-making models.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Students have in-depth knowledge of various decision-making models, involving game-theory models and robust/stochastic optimization.

relating to skills:

PEU_U01 Student can apply decision-making models to practical situations.
PEU_U02 Student can compute and interpret a solution to basic decision-making models.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Classification of decision problems.	2
Lec 2	Modeling of risk and uncertainty in optimization problems.	2
Lec 3	Elements of stochastic and robust optimization with application to portfolio selection problem.	2
Lec 4	Games in extensive and normal form.	2
Lec 5	Equilibria in non-cooperative games.	2
Lec 6	Zero-sum games. Solving zero-sum games by using linear programming.	2
Lec 7	Applications on noncooperative *n*-person games.	2
Lec 8	Games with communications. Correlated equilibria.	2
Lec 9	Two-person bargaining problem. Nash solution concept.	2
Lec 10	Games in coalitional form. The concept of the core.	2
Lec 11	The Shapley value.	2
Lec 12	Decision making under risk – von Neumann and Morgenstern utility theory.	2
Lec 13	Decision making under uncertainty.	2
Lec 14	Group decision making. The Arrow's paradox.	2
Lec 15	Written test	2
	Total hours	**30**

Laboratory		**Number of hours**
Lab 1-2	Solving deterministic optimization problems using AMPL language.	4
Lab 3-5	Solving stochastic and robust optimization problems using AMPL language.	6
Lab 6	Solving zero-sum games using AMPL language.	2
Lab 7-10	Solving non-cooperative games.	8
Lab 11-12	Solving cooperative games.	4
Lab 13-14	Solving decision problems under risk and uncertainty.	4

Lab 15	Written test.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Presentation N2. List of tasks N3. Mathematical programming languages and software tools for game theory

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes	Way of evaluating learning outcomes achievement
F1	PEU_W01	Written test
F2	PEU_U01 PEU_U02	Solving tasks during classes (activity during classes)
F3	PEU_U01 PEU_U02	Written test using computer software.
P (Lecture) = F1 P (Laboratory) = 0.2 F2 + 0.8 F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. R. D. Luce, H. Raiffa. Games and decisions. Introduction and critical survey. Dover Publication Inc. 1957.
2. E. Prisner. Game theory through examples. MAA 2014.
3. P. Kall, J. Mayer. Stochastic linear programming. Models, theory and computation. International Series in Operations Research and Management Science. Springer 2011

SECONDARY LITERATURE:

1. R. Myerson. Game Theory: Analysis of conflict, Harvard University Press, 1997
2. H. Peters. Game Theory. A multi-level approach. Springer 2008
3. N. Nisan, T. Roughgarden, E. Tardos, V. Vazirani (eds.). Algorithmic game theory. Cambridge University Press 2007

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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Analityka wizualna
Name of subject in English: Visual Analytics
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2005
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**15**		
Number of hours of total student workload (CNPS)	**30**		**60**		
Form of crediting			**crediting with grade**		
For group of courses mark (X) final course			**X**		
Number of ECTS points			**3**		
including number of ECTS points for practical classes (P)			**2**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)			**2,1**		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of data mining methods and techniques.
2. Basics of statistical and data visualization software.

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SUBJECT OBJECTIVES

C1 Learning advanced algorithms for visual analytics.
C2 Learning advanced data mining techniques, including clustering and grouping algorithms.
C3 Acquiring data reporting skills through the use of advanced data visualization.
C4 Mastering business modelling techniques and analysis techniques to turn data into useful insights in the management process.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 The student has knowledge of the methods and techniques of modern analytics useful in management decision-making processes.
PEU_W02 The student has knowledge of computer decision support tools as well as data visualization and reporting systems.
relating to skills:

PEU_U01 The student is able to properly select data mining techniques and apply them to data analysis.
PEU_U02 The student is able to properly select and apply selected information technologies in order to visualize data and prepare a data report
relating to social competences:
PEU_K01 The student is able to interact and work in a group, appropriately dividing the tasks to be performed among individual group members.
PEU_K02 The student is able to independently develop his knowledge and skills, is ready to identify, analysis and solve problems in the identification and analysis of decision problems with the help of data mining, visualization and reporting .

PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1	Introduction to the methodology and practice of applying modern techniques of data mining, analysis, visualization and reporting. Data visualization in Tableau and R.	1
Lec 2, 3	Visualizing descriptive statistics and forecasts. Data preparation. Differences between data analysis and presentation. Iterative process of data mining.	4
Lec 4, 5, 6	Visualizing clustering and grouping. Algorithms and evaluation methods.	6
Lec 7	Spatial and multidimensional visualization. Utilizing decision trees.	2
Lec 8	Visualization as an analytical tool. Description, data analysis, interpretation and drawing conclusions based on data - rules, errors, examples. Good practices of data visualization.	2
	Total hours	15

Laboratory		**Number of hours**
Lab 1	Overview of a design task. Data visualization in Tableau and R.	1
Lab 2, 3	Visualizing descriptive statistics and forecasts. Data preparation. Differences between data analysis and presentation. Iterative process of data mining.	4
Lab 4, 5, 6	Visualizing clustering and grouping. Algorithms and evaluation methods.	6
Lab 7	Spatial and multidimensional visualization. Utilizing decision trees.	2
Lab 8	Visualization as an analytical tool. Description, data analysis, interpretation and drawing conclusions based on data - rules, errors, examples. Good practices of data visualization. Discussion of the final projects.	2
	Total hours	15

TEACHING TOOLS USED

N1. Multimedia presentations.
N2. Data collection.
N3. Computer data analysis - software: Tableau, R.
N4. Teaching materials published on eportal.

N5. Teamwork - group project.
N6. Optionally alternative software packages: PowerBI, Alteryxa, Board, Weka

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, W02	Based on project reports
F2	PEU_U01, U02 PEU_K01, K02	Project reports
P = F1 + F2 - computed in percentage points (%), transformed into the scale 2-5.5		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Nussbaumer Knaflic C., (2015) Storytelling with Data: A Data Visualization Guide for Business Professionals, J. Wiley & Sons
[2] Sharda R., Delen D., Turban E., (2015) Business Intelligence and Analytics. Systems for Decision Support, Pearson
[3] Larose D.T., (2014) Discovering Knowledge in Data: An Introduction to Data Mining, J. Wiley & Sons

SECONDARY LITERATURE:

[1] Yau N., (2013) Data points. Visualization that means something, J. Wiley & Sons
[2] Loth A., (2019) Visual Analytics with Tableau, J. Wiley & Sons
[3] Zumel N., Mount J., (2019) Practical Data Science with R, 2nd ed, Black&white.
[4] Morzy T., (2013) Eksploracja danych. Metody i algorytmy, WN PWN
[5] Evans J.R., (2016) Business Analytics. Methods, Models, and Decisions, Pearson
[6] Larose D.T., (2005) Discovering Knowledge in Data. An Introduction to Data Mining, J. Wiley & Sons
[7] Surma J., (2009) Business Intelligence. Systemy wspomagania decyzji biznesowych, WN PWN
[8] Wilke C.O., (2020) Podstawy wizualizacji danych: zasady tworzenia atrakcyjnych wykresów, Helion
[9] Provost F., Fawcett T., (2015) Analiza danych w biznesie. Sztuka podejmowania skutecznych decyzji, Helion
[10] Stephenson D., (2019) Big Data. Nauka o danych i AI bez tajemnic, Helion
[11] Foreman J.W., (2017) Mistrz analizy danych. Od danych do wiedzy, Helion

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Anna Skowrońska-Szmer, anna.skowronska-szmer@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY Of MANAGEMENT

Name of subject in Polish Pozyskiwanie i analiza danych stron www
Name of subject in English Web scraping and data analysis
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2006
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**15**		
Number of hours of total student workload (CNPS)	**30**		**60**		
Form of crediting			**crediting with grade**		
For group of courses mark final course with (X)			**X**		
Number of ECTS points			**3**		
including number of ECTS points for practical classes (P)			**2**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)			**2,1**		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge and ability to use R program
2. Basic knowledge of HTML and CSS

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SUBJECT OBJECTIVES

C1: Technical knowledge necessary to quickly obtain a large amount of data, automate this process.
C1: Mastering the ability to process such data into useful information supporting management processes.
C3: Mastering the ability to use the R program throughout the process: from data acquisition to analysis.

SUBJECT EDUCATIONAL EFFECTS

Relating to knowledge:

PEU_W01: Basic knowledge to obtain and analyze data from websites.

Relating to skills:

PEU_U01: Ability to design and implement a procedure for obtaining data from websites, and then apply statistical methods to analyze such data.

PROGRAM CONTENT		
Lectures		**Number of hours**
Lec 1	Internet as a source of data supporting decision-making processes.	1
Lec 2	String manipulation utilities.	1
Lec 3	Searching patterns. Regular expression.	2
Lec 4	Data extraction models and techniques.	2
Lec 5	Parsing HTML data,.	3
Lec 6	Writing web crawlers. Case study.	3
Lec 7	Crawling through APIs.	1
Lec 8	Test	2
	Total hours	**15**

Laboratory		**Number of hours**
Lab 1	Web scraping in R.	1
Lab 2	Task 1. Data wrangling.	2
Lab 3	Task 2. String manipulation on the example of a selected website.	4
Lab 4	Task 3. Creating a crawler for a selected decision problem.	6
Lab 5	Discussion of the results.	2
	Total hours	**15**

TEACHING TOOLS USED

N1. Presentation

N2. Solving problems, case study

N3. Statistical program R, scripts in R

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Learning outcomes number	Way of evaluating learning outcomes achievement
F1	PEU_W01	Written test
F2	PEU_U01	Taks 1-3
P = 0.3*F1 + 0.7*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[4] Kapłon R. *Lecture notes* [available on ePortal]
[5] Mitchell R. *Web Scraping with Python, 2nd Edition*, O'Reilly Media, 2018.

SECONDARY LITERATURE:

[6] Aydin O. *R Web Scraping Quick Start Guide*, Packt Publishing, 2018.
[7] Fitzgerald M. *Introducing Regular Expressions*, O'Reilly Media, 2012.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Dr inż. Robert Kapłon; robert.kaplon@pwr.wroc.pl

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish Usługi chmurowe
Name of subject in English Cloud computing services
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2007
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			**15**		**15**
Number of hours of total student workload (CNPS)			**60**		**60**
Form of crediting			**crediting with grade**		**crediting with grade**
For group of courses mark (X) final course					**X**
Number of ECTS points					**4**
including number of ECTS points for practical classes (P)					**4**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**2,8**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic understanding of multi-tier architecture and Internet applications.

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SUBJECT OBJECTIVES

C1 Acquire knowledge of the capabilities and applications of modern cloud technologies in management, supporting the functioning of organizations and in the work of the engineer-manager.
C2 Acquire skills in selecting and configuring cloud services, with a focus on big data and business intelligence applications.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Has knowledge of the operation and functionality of cloud technologies and services.
PEU_W02 Has knowledge of the applications of cloud services in management, supporting the operations of organizations and in the work of engineers/managers.
relating to skills:
PEU_U01 Can acquire the information necessary to identify modern cloud technologies and services, can compare offerings in the vendor market and match them to the organization's needs.
PEU_U02 Can identify features, advantages, disadvantages and applications of existing cloud technologies and can critically evaluate them.
PEU_U03 Can implement selected solutions to support the operations of organizations and the work of engineers/managers, especially in the areas of big data and business intelligence.

PROGRAMME CONTENT		
Laboratory		**Number of hours**
Lab 1	Discussing the safety and class regulations as well as the scoring/grading policy.	1
Lab 2	Explanation and demonstration of how to work with selected cloud services. Allocation of tasks. Setting up accounts.	2
Lab 3	Task 1: Identifying features of the selected vendor and configuring typical services.	2
Lab 4	Task 1: Testing, presenting and discussing results.	4
Lab 5	Task 2: Individual or team project on specific cloud services (in big data and business intelligence).	
Lab 6	Task 2: Testing, presenting and discussing results.	2
Lab 7	Task 3: Extra task on interoperability of services. Grading.	2
	Total hours	15
Seminar		**Number of hours**
Semin 1	Introduction to the seminar. Discussing the class rules and the scoring/grading policy. Allocation of topics to be presented.	1
Semin 2	Types of clouds and models of cloud services. The benefits of cloud computing.	2
Semin 3	Basic file storage and synchronization services.	2
Semin 4	Cloud solutions offered by leading global providers such as Microsoft, Amazon, Google, IBM, Oracle.	2
Semin 5	Cloud solutions offered by Polish companies, such as Octawave, Beyond.	2
Semin 6	Applications of the cloud in various areas of business activity.	2
Semin 7	Component selection and migration to the cloud. Reliability, security and legal aspects.	2
Semin 8	Challenges of the future and directions of cloud services development. Summary of the topics discussed throughout the semester.	2
	Total hours	15

TEACHING TOOLS USED
N1. Resources published in the university ePortal course website. N2. Lab assignment lists and seminar topics. N3. Google, Microsoft, Amazon and Oracle cloud web services. N4. Scientific elaboration of topics based on literature analysis. N5. Presentation of issues at the seminar - slideshow or software, and discussion. N6. Group discussion.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_W02	Evaluation of the content and presentation of the seminar essay and participation in the discussion.

F2	PEU_U01, PEU_U02, PEU_U03	Evaluation of the lab assignments and reports.
P = 0,5*F1 + 0,5*F2. Passing scores of both F1 and F2 required.		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Papers, links and instructions published in the university ePortal course website.
[2] Haque E., The Ultimate Modern Guide to Cloud Computing: Everything from Cloud Adoption to Business Value Creation. IP 2020.
[3] Ainsley A., Google Cloud Platform: Learn Google Cloud Platform from the Scratch: The Ultimate Guide for Beginners, IP 2020.
[4] Gouic B., Microsoft Azure Tutorial: Public Cloud Computing platform. GB 2020.

SECONDARY LITERATURE:

[1] Hunter T., Building Google Cloud Platform Solutions: Develop scalable applications from scratch and make them globally available in almost any language, Packt Publishing, 2019.
[2] Toroman M., Azure Networking Cookbook: Practical recipes for secure network infrastructure, global application delivery, and accessible connectivity in Azure, Packt Publishing, 2021.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Wiesław Dobrowolski, wieslaw.dobrowolski@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish Seminarium dyplomowe I (BI days)
Name of subject in English Diploma seminar I (BI days)
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, uniform magister studies*, full-time
Kind of subject: obligatory Subject code IZZ2008S
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					15
Number of hours of total student workload (CNPS)					30
Form of crediting	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	Examination / crediting with grade*	crediting with grade*
For group of courses mark (X) final course					
Number of ECTS points					1
including number of ECTS points for practical classes (P)					1
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					0,7

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

none

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SUBJECT OBJECTIVES

C1 Enabling students to share their previous experience and scientific interests
C2 Enabling students to get to know and establish cooperation with potential supervisors

SUBJECT EDUCATIONAL EFFECTS/ SUBJECT LEARNING OUTCOMES

relating to skills:
PEU_U01 the student is able to look for useful sources of information (including English-language ones), methods and techniques and properly use them, integrate them, make their interpretation and critical evaluation, draw conclusions and formulate and exhaustively justify opinions
PEU_U02 the student can use information and communication techniques, applicable at various stages of the implementation of the diploma thesis;

PEU_U03 when preparing the presentation, he/ she is able to communicate in English using specialized terminology, using various techniques, also with the use of IT tools;

relating to social competences:
PEU_K01 the student has the ability to clearly formulate conclusions and present the results in a way that is understandable to a wide audience;
PEU_K02 the student is able to take an active part in the discussion

PROGRAMME CONTENT

	Seminar	**Number of hours**
Se1	Organizational meeting.	1
Se2-Se4	Presentations and discussions: First BI Day	7
Se5-S8	Presentations and discussions: Second BI Day	7
…		
	Total hours	15

TEACHING TOOLS USED

N1. Presentation
N2. Discussion
N3. Workshop

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_U01-03,	Preparing a presentation on the BI days' workshop
F2	PEU_U01-03, PEU_K01	Presenting the prepared presentation during the BI days' workshop
F3	PEU_KO2	Participation in discussions
P= F1*0,2+F2*0,5+F3*0,3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Jonker, J., & Pennink, B. (2010). The essence of research methodology: A concise guide for master and PhD students in management science. Springer Science & Business Media.
[2] Taylor, B., Sinha, G., & Ghoshal, T. (2006). Research methodology: A guide to for reseachers in management and social sciences. PHI Learning Pvt. Ltd..
[3] Scandura, T. A., & Williams, E. A. (2000). Research methodology in management: Current practices, trends, and implications for future research. Academy of ManagementJjournal, 43(6), 1248-1264.

SECONDARY LITERATURE:

[1] 11 design tips for beautiful presentations by Katy French
[2] 8 tips for an awesome PowerPoint presentation by Damon Nofar

[3] PowerPoint alternatives (including Prezi for animated, "non-linear" presentations) by Andrew Kunesh
[4] Czakon, W. (Ed.). (2011). Podstawy metodologii badań w naukach o zarządzaniu. Wolters Kluwer Polska.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Prof. dr hab. inż. Rafał Weron rafal.weron@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Seminarium dyplomowe 2
Name of subject in English: Diploma seminar 2
Main field of study: Business Engineering
Specialization: Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code IZZ2009S
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**15**
Number of hours of total student workload (CNPS)					**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**2**
including number of ECTS points for practical classes (P)					**2**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**1,4**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Cross-sectional knowledge of issues from the previous course of study
2. General knowledge of the subjects pursued in the course of study

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SUBJECT OBJECTIVES

C1 To prepare students for the preparation of a Master's thesis according to the requirements.
C2 To acquire the ability to formulate the aim of the thesis and to plan its structure.
C2 To acquire the skills of writing the thesis in terms of using literature sources, carrying out the work and interpreting the results, taking into account editorial recommendations.
C3 To improve the ability to present one's own ideas, concepts and planned solutions.
C4 To consolidate skills of creative discussion in which one can justify and defend one's position in substantive manner.
C5 To prepare for the diploma exam.

SUBJECT EDUCATIONAL EFFECTS

relating to skills:
PEU_U01 Is able to identify a managerial problem and plan its solution using appropriate methods, techniques and tools.

PEU_U02 Can prepare a presentation containing an analysis of results and problem solution concepts.
PEU_U03 Can reason in a discussion, justify his/her ideas and solutions and critically evaluate planned actions and solutions of others.

PROGRAMME CONTENT

Seminar		Number of hours
Semin 1	Introduction to the seminar. Discussing the class rules and the scoring/grading policy.	1
Semin 2	Overview of university and departmental requirements for thesis. Overview of the process and timeline for graduation. Principles of formulating the topic and purpose of the thesis, adequately to the indicated managerial problem. Examples of good and bad thesis topics/objectives. Discussion of the thesis statement template. Topic, purpose, scope, structure.	2
Semin 3	Overview of the construction of the paper - table of contents, introduction and conclusion. Common mistakes in the work. Referencing and discussion of the progress in choosing a topic and supervisor.	2
Semin 4	Overview of editing requirements. Discussion of how to access literature databases and how to use, analyze, and cite literature sources. Consultation of the first version of the thesis statement. Assignment of dates for individual presentations.	2
Semin 5	Discussion of the criteria for the final evaluation of the work (review form). The concept of plagiarism; anti-plagiarism system. Approval of the final version of the thesis statement. Referring, consulting and discussing problems and progress in the thesis. Presenting recommendations on how to present the progress of the thesis during the next classes.	2
Semin 6	Discussion of the diploma exam. Examination topics and questions. Referencing, consultation and discussion of problems and progress of the thesis. Individual presentations of progress and further plans for completion of the thesis (1). Discussion.	2
Semin 7	Individual presentations of progress and further plans for completion of the thesis (2). Discussion.	2
Semin 8	Individual presentations of progress and further plans for completion of the thesis (3). Discussion.	2
	Total hours	15

TEACHING TOOLS USED

N1. Presentations of selected issues related to the thesis topic.
N2. Multimedia presentations - own and foreign (positive and negative examples).
N3. Problem discussion, recognizing advantages and criticizing disadvantages of solutions.
N4. Individual consultations of students' problems connected with planning and progress of the work

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_U01	Timely submission and evaluation of a working statement of work (topic, purpose, problem, concept, initial structure)
F2	PEU_U02	Evaluation of the preparation and presentation of the progress of the thesis and plans for further activities.
F3	PEU_U03	Participation in the discussion.
P = 0,3*F1 + 0,5*F2 + 0,2*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

Literature related to the problems of the thesis - independently selected and recommended by the thesis supervisor.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Bożena Mielczarek Bozena.Mielczarek@pwr.edu.pl
Wiesław Dobrowolski Wieslaw.Dobrowolski@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Analityka opisowa
Name of subject in English Descriptive analytics
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code MAZ2581
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**30**		**30**		
Number of hours of total student workload (CNPS)	**120**		**90**		
Form of crediting	**Examination**		**crediting with grade**		
For group of courses mark (X) final course					
Number of ECTS points	**4**		**3**		
including number of ECTS points for practical classes (P)			**3**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**2,8**		**2,1**		

*delete as not necessary

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. 1. Basic knowledge of probability theory

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SUBJECT OBJECTIVES

C1 Knowledge and understanding of the statistical methods used for data description and inferences

C2 Education skills of data descriptions

C3 Education of skills of data analysis

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 – Knows how to describe and approximate the distribution of a random variable. Understands how to apply the theory to empirical problems.

PEU_W02 – Knows methods of modeling continuous data with a linear and a non-linear regression model. Understands how to apply the theory to empirical problems.

PEU_W03 – Knows methods of modeling discrete data. Understands how to apply the theory to empirical problems.

Relating to skills:

PEU_U01 - Understands and is able to use theoretical knowledge in statistics to describe the properties of the data and analyze the relationship between variables.

PEU_U02 - Understands and is able to use theoretical knowledge in statistics and econometrics to infer from the data about social or economic processes

Relating to social competences:

PEU_K01 - Can prepare in a small group solutions to practical statistical problems and present the results of the analysis

PROGRAMME CONTENT		
Lecture		**Number of hours**
L1	Introduction; Data types	2
L2	Measures of dispersion and location	2
L3	Approximation of the distribution of the data – kernel estimation	2
L4	Modeling relationship between variables: descriptive analysis (correlation), graphical presentation (scatterplot) and regression	2
L5-6	Least Square (LS) estimation method - constrained and unconstrained optimization	4
L7-8	Application of LS to a linear regression model: model specification and verification	4
L9-10	Application of LS to a nonlinear regression model (Smooth Transition Regression)	4
L11	Principal component (PC) method – reduction of the data dimension	2
L12-13	Regularization methods (LASSO)	4
L14-15	Probit/logit models of binominal data	4
	Suma godzin	**30**
Classes		**Number of hours**
Cl 1		
Cl 2		
Cl 3		
Cl 4		
..		
	Total hours	

Laboratory		Number of hours
Lab1	Introduction to Matlab (scripts, functions)	2
Lab2	Loading and visualization of the data	2
Lab3	Measures of dispersion and location	2
Lab4	Approximation of the distribution of the data – kernel estimation	2
Lab5	Modeling relationship between variables: descriptive analysis (correlation), graphical presentation (scatterplot) and regression	2
Lab6-8	Application of LS to a linear regression model: model specification and verification, restrictions	6
Lab9-10	Application of LS to a nonlinear regression model (Smooth Transition Regression)	4
Lab11-13	Shrinkage methods: Principal components (PC) , LASSO	6
Lab 14-15	Probit/logit models of binominal data	4
	TOTAL HOURS	30

TEACHING TOOLS USED
Lectures N1. Multimedia presentation N2. Solving of exemplary problems Laboratories N3.matlab and R environment N4. Multimedia presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_W02, PEU_W03	Exam, in a scale 2-5.5
F2—F6	PEU_U01, PEU_U02, PEU_K01	Assignments 1-5, expressed in percentage points (%)
P(Lecture) = F1 P(Lab) = (F2+F3+F4+F5+F6)/5 - computed in percentage points (%), transformed into the scale 2-5.5		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Peck, Olsen, Devore, (2015), *Introduction to statistics and data analysis*, Cengage Learning, Inc. **SECONDARY LITERATURE:** [8] Greene W.H. (2019), *Econometric Analysis*, Pearson Education Limited [9] Wooldridge, J.M. (2014), *Introductory Econometrics : A Modern Approach*, South Western Educational Publishing [10] Heiss F. (2016), *Using R for Introductory Econometrics*, CreateSpace Independent Publishing Platform [11] Gordon S.I., B. Guilfoos (2017), *Introduction to Modeling and Simulation with MATLAB® and Python*, CRC Press
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
Dr Katarzyna Maciejowska Katarzyna.maciejowska@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Analityka predykcyjna
Name of subject in English: Predictive analytics
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code MAZ2582
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**30**		**30**		
Number of hours of total student workload (CNPS)	**90**		**90**		
Form of crediting	**Exam**				
For group of courses mark (X) final course	**X**				
Number of ECTS points	**6**				
including number of ECTS points for practical classes (P)			**3**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**4,2**				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Programming skills in Matlab / Octave, R or Python environments
2. Knowledge of the basics of probability theory and mathematical statistics

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SUBJECT OBJECTIVES

C1: Acquiring knowledge about forecasting and the ability to apply it in business practice

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Knows advanced forecasting methods. Has an in-depth knowledge of selected linear and non-linear forecasting techniques for decision support in a changing or uncertain environment.

relating to skills:
PEU_U01 Is able to choose the right forecasting method and build a forecasting model. Can assess the quality of forecasts. Can use forecasting techniques to solve complex management decision problems.

relating to social competences:
PEU_K01 Is aware of the need for independent, critical assessment of the scope and level of knowledge in the field of predictive analytics. Is prepared to independently search for knowledge in this area.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1-2	The forecaster's toolbox: Training, validation and testing, seasonal decomposition, transformations, point vs probabilistic forecasts	4
Lec 3	Exponential smoothing	2
Lec 4-5	Time series regression models	4
Lec 6-7	Evaluating forecast accuracy, residual diagnostics	4
Lec 8-9	Neural networks, shallow vs deep, recurrent and LSTM networks	4
Lec 10-11	Combining forecasts, bootstrapping and bagging	4
Lec 12-13	Forecasting hierarchical or grouped time series	4
Lec 14-15	Quantile regression	4
	Total hours	**30**

Laboratory		**Number of hours**
Lab 1-2	The forecaster's toolbox: Training, validation and testing, seasonal decomposition, transformations, point vs probabilistic forecasts	4
Lab 3	Exponential smoothing	2
Lab 4-5	Time series regression models	4
Lab 6-7	Evaluating forecast accuracy, residual diagnostics	4
Lab 8-9	Neural networks, shallow vs deep, recurrent and LSTM networks	4
Lab 10-11	Combining forecasts, bootstrapping and bagging	4
Lab 12-13	Forecasting hierarchical or grouped time series	4
Lab 14-15	Quantile regression	4
	Total hours	**30**

TEACHING TOOLS USED
N1. Multimedia presentations. N2. Computational tasks in MATLAB/Octave, Python or R.

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes	Way of evaluating learning outcomes achievement
F1	PEU_W01, PEU_U01, PEU_K01	Assignments (in-class, reports)
F2	PEU_W01, PEU_U01	Exam

P = F1 + F2; computed in percentage points (%), transformed into the scale 2-5.5

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] R. Hyndman, G. Athanasopoulos (2021) *Forecasting: Principles and Practice*, 3rd ed., OTexts (https://otexts.com/fpp3)

SECONDARY LITERATURE:

[1] F. Diebold (2015) *Comparing predictive accuracy, twenty years later: A personal perspective on the use and abuse of Diebold-Mariano tests*, Journal of Business & Economic Statistics 33:1, 1-9

[2] G. Elliott, C.W.J. Granger, A. Timmermann, eds. (2006) *Handbook of Economic Forecasting*, North Holland

[3] R. Hyndman, A. Koehler (2006) *Another look at measures of forecast accuracy*, International Journal of Forecasting 22(4), 679-688

[4] J. Nowotarski, R. Weron (2018) *Recent advances in electricity price forecasting: A review of probabilistic forecasting*, Renewable and Sustainable Energy Reviews 81(1), 1548-1568

[5] R. Weron (2014) *Electricity price forecasting: A review of the state-of-the-art with a look into the future*, International Journal of Forecasting 30(4), 1030-1081

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Rafał Weron (rafal.weron@pwr.edu.pl)

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Analiza Normatywna
Name of subject in English: Prescriptive Analytics
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level studies, full-time
Kind of subject: obligatory
Subject code MAZ2583
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**30**		**30**		
Number of hours of total student workload (CNPS)	**60**		**90**		
Form of crediting	**Examination**		**Crediting with grade**		
For group of courses mark (X) final course					
Number of ECTS points	**2**		**3**		
including number of ECTS points for practical classes (P)			**3**		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**1,4**		**2,1**		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of matrix algebra
2. Ability to use computational software (MATLAB, R)

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SUBJECT OBJECTIVES

C1 To gain knowledge on formulating decision models
C2 To learn how to evaluate alternatives
C3 To be able to build composite indicators

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Student has in-depth knowledge of mathematical models to support decision making in management.
PEU_W02 Student has knowledge of building composite indicators under different preference structures.

relating to skills:
PEU_U01 Student can formulate decision models.

PEU_U02 Student can evaluate alternatives and support decision making.

relating to social competences:
PEU_K01 Student can enlarge His/Her knowledge and abilities, as well as to work in groups to formulate and to appraise decision models.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Decision Analysis, Decision Support Systems and Business Intelligence	2
Lec 2	Decision Tree Analysis to Evaluate Alternatives	2
Lec 3	Fundamentals of Linear Programming	2
Lec 4	Duality and Sensitivity Analysis	2
Lec 5	Transportation and Assignment Problems	2
Lec 6	Graph Theory and Optimization	2
Lec 7	Multi-objective Mathematical Programming	2
Lec 8	Multi-Criteria Analysis	2
Lec 9	UTA Method and its Variants	2
Lec 10	Analytic Hierarchy Process	2
Lec 11	Efficiency Measurement	2
Lec 12	Incorporating Value Judgments in Efficiency Measurement	2
Lec 13	Efficiency Measurement in Processes with Network Structures	2
Lec 14	Building Indices with Hierarchical Structure	2
Lec 15	Course Assessment	2
	Total hours	30

Laboratory		**Number of hours**
Lab 1	Introduction to Matlab, R – lpsolve and Gurrobi Optimizer	2
Lab 2	Decision Tree Analysis	2
Lab 3	LP formulation in Matlab, R	2
Lab 4	Sensitivity Analysis and Visualization	2
Lab 5	Specific Cases in Linear Programming	2
Lab 6	Specific Cases in Linear Programming	2
Lab 7	Solution Methods in Multi-objective Mathematical Programming	2

Lab 8	Presentation of Group Assignments	2
Lab 9	UTASTAR and UTADIS - Applications	2
Lab 10	Group Decision Making with Analytic Hierarchy Process	2
Lab 11	Performance Measurement	2
Lab 12	Hybrid Approaches in Performance Measurement	2
Lab 13	Performance of Supply Chains	2
Lab 14	Deriving Composite Indicators	2
Lab 15	Presentation of Group Assignments	2
	Total hours	30

TEACHING TOOLS USED
N1. Slide Presentations N2. Step-by-step solutions of examples N3. Set of case studies and software illustration (Matlab, R)

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes	Way of evaluating learning outcomes achievement
F1	PEU_U01, PEU_U02, PEU_K01	Report of team work results
F2	PEU_U01, PEU_U02, PEU_K01	Report of team work results
F3	PEU_W01, PEU_W02, PEU_U01, PEU_U02	Test
P (W) = 0.5 F3 + 0.5 Participation P (L) = 0.4 F1 + 0.4 F2 + 0.2 Participation		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Greco, S., Figueira, J., & Ehrgott, M. (2016). Multiple criteria decision analysis. New York: Springer.
[2] Cooper, W. W., Seiford, L. M., & Tone, K. (2006). Introduction to data envelopment analysis and its uses: with DEA-solver software and references. Springer Science & Business Media.
[3] Miettinen, K. (2012). Nonlinear multiobjective optimization. Springer Science & Business Media.

SECONDARY LITERATURE:

[1] Dantzig, G. B., & Thapa, M. N. (2006). Linear programming 2: theory and extensions. Springer Science & Business Media.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Dimitrios Sotiros (dimitrios.sotiros@pwr.edu.pl)

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Psychologia Biznesu
Name of subject in English: Business Psychology
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: optional
Subject code PSZ2509
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**30**
Number of hours of total student workload (CNPS)					**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**2**
including number of ECTS points for practical classes (P)					**2**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**1,4**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of general psychology, i.e. mechanisms that guide thinking, decision-making and motivated human behavior
2. Ability to speak and write concisely.
3. Knowledge of presentation techniques.
4. Ability to work in groups.

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SUBJECT OBJECTIVES

C1 Acquainting students with the psychology of individual and group behavior and their interaction
C2 Developing awareness of the importance of psychological aspects of matching an individual to specific career patterns
C3 Acquainting students with the importance of leadership in an organization and psychological processes in terms of predictors and leadership consequences for organizations and employees
C4. Developing skills associated with researching theoretical and practical data, understanding results of scientific research, communicating effectively outcomes of scientific research

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Understands the role of the interaction of individuals and groups in a specific organizational context.
relating to skills:

PEU_U01 Identifies psychological factors contributing to employees work motivation, satisfaction and engagement.
PEU_U02 Identifies psychological factors contributing to effective managing people in project tasks and successful organizational leadership.
relating to social competences:
PEU_K01 Communicates effectively and empathetically with others, while respecting different perspectives and worldviews
PEU_K02 Can convey his own views and stand up for them. Is prepared to persuade and negotiate for the sake of achieving common goals.

PROGRAMME CONTENT

Seminar		**Number of hours**
Se 1	Analysis of the organization as an interactive system of mutual interactions between employees and the organization - a psychological perspective	2
Se 2	Individual differences of employees and their fit to the profession	2
Se 3	Individual differences between employees in terms of resources and ability to meet job demands: cognitive demands, emotional demands, quantitative demands, and work pace	2
Se 4	Perception of meaning of work and the sense of influence at work	2
Se 5	Attitudes, values and job satisfaction as determinants of commitment to work	2
Se 6	Employee - co-workers - managers interactions: social climate at work, sense of justice, and relations with management	2
Se 7	Motivation at work: internal employee motivation: determinants and consequences	2
Se 8	Motivation at work: external motivators and their importance	2
Se 9	Building teams and effective functioning of teams	2
Se 10	Individual behavior in project teams; innovative teams of the world	2
Se 11	Psychology decision-making and moral judgment: cases of bankruptcy of "big business"	2
Se 12	The emergence of leadership: psychological and organizational determinants of differences between leaders and managers. A biographical study of great world leaders.	2
Se 13	Employee well-being: health, stress, and stress coping	2
Se 14	Mobbing at work	2
Se 15	Psychological differences between employees of business organizations and non-governmental organizations	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Analyzing scientific publications
N2. Case studies
N3. In-class video material/discussion
N4. Multimedia presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1 two (2) assignements/tasks	PEU_U01, PEU_U02	Assessment of the formal value and practical significance of the tasks performed
F2 (in-class activity)	PEU_K01, PEU_K02	Appraisal of in-class activity and group work
P (seminar) 2*0,4*F1 + 0,2*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] McKenna, E. (2020; 6th ed.). *Business psychology and organizational behaviour.* Routledge: ISBN-13: 978-1138182646

[2] Johnson, R.D., ed. (2021). *Handbook of research on multidisciplinary perspectives on managerial and leadership psychology (Advances in logistics, operations, and management science).* Business Science Reference: ISBN-13: 978-1799838111

[3] Sawhney, G., Michel, J.S. (2021). Challenge and Hindrance Stressors and Work Outcomes: the moderating Role of Day-Level Affect. *Journal of Business and Psychology*, 36,4.

SECONDARY LITERATURE:

[2] Kahneman, D. (2013). *Thinking, Fast and Slow.* Farrar, Straus and Giroux: ISBN 13: 978-0374533557

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Jolanta Babiak Jolanta.babiak@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Kierowanie zespołami i grupami roboczymi
Name of subject in English: Leading teams and work groups
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: optional
Subject code PSZ2510
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**30**
Number of hours of total student workload (CNPS)					**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**2**
including number of ECTS points for practical classes (P)					**2**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**1,4**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Ability to speak and write concisely.
2. Knowledge of presentation techniques.
3. Ability to work in groups.

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SUBJECT OBJECTIVES

C1 Acquainting students with leading effective teams and work groups
C2 Acquainting students with the psychological processes of emergence of team leadership and the consequences of dysfunctional leadership
C3 Developing the ability to build effective teams and work groups
C3 Developing skills related to analyzing theoretical data and conducting empirical research, understanding research results, effectively communicating research results in the field of team and working group leadership

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Has knowledge of how to effectively build and manage teams and workgroups

relating to skills:

PEU_U01 Has the ability to take the role of a team leader, deal with conflicts, time pressure and other responsibility systems

PEU_U01 Skillfully uses tools to measure team effectiveness, predict effectiveness and identify adequate consequences

relating to social competences:
PEU_K01 Communicates effectively and empathetically with others while respecting different perspectives
PEU_K02 Is prepared to persuade and negotiate for the sake of achieving common goals

PROGRAMME CONTENT

Seminar		Number of hours
Se 1	Types of teams; differences between teams and workgroups	2
Se 2	Leading teams and work groups: individual differences between members and the cohesion of teams and groups	2
Se 3	Developing trust between team members and workgroups	2
Se 4	Communication in teams and workgroups	2
Se 5	Supporting community in terms of attitudes, values and commitment to the work of the team or working groups	2
Se 6	Managing the decision-making process in teams and working groups	2
Se 7	Developing social capital through networking and information exchange	2
Se 8	Motivation: internal motivation of team members and groups - determinants and consequences; external motivators and their meaning	2
Se 9	Building and developing effective teams and work groups	2
Se 10	Measurement of the effectiveness of teams and working groups	2
Se 11	Managing conflicts in teams and working groups	2
Se 12	Psychological determinants of dysfunctional teams and groups	2
Se 13	Supporting creativity and innovation among team members and working groups (the most innovative teams in the world)	2
Se 14	Rewarding teams and workgroups	2
Se 15	Leading virtual teams and workgroups	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Analyzing scientific publications
N2. Case studies
N3. In-class video material/discussion
N4. Multimedia presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1(1) assignments/tasks	PEU_W01, PEU_U01, PEU_U02	Assessment of the formal value and practical significance of the tasks performed
F2 (2) assignments/tasks	PEU_W01, PEU_U01, PEU_U02	Assessment of the formal value and practical significance of the tasks performed

F3 (in-class activity)	PEU_K01, PEU_K02	Appraisal of in-class activity and group work
P (seminar) 0,4*F1+ 0,4*F2+ 0,2*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Thompson, L. (2017). *Making the team. A guide for managers* (6th edition). Pearson ISBN-10: 0134484207

ISBN-13: 978-0134484204

[2] Govindarajan, V. & Trimble, C. 2010. Assemble the Dedicated Team: Seven Common Traps to Avoid When Building an Innovation Team; Harvard Business School; 7055BC-PDFENG; 30p [3] Sethi, R., Smith, D. C., Park, W. C. 2002. How to kill a team's creativity. Harvard Business Review, Volume: 80, Issue: 8, pp: 16-17.

SECONDARY LITERATURE:

[1] "Teams": Group Dynamics For Teams, by Daniel Levi, 4th Edition (2014), Sage Publications; ISBN 978-1-4129-9953-3

[2]"Conversations": Difficult Conversations: How To Discuss What Matters Most, by Douglas Stone, Bruce Patton, and Sheila Heen; Penguin Books (2010); ISBN 978-0-14-311844-2

[3] Assigned TED conferences and podcasts; examples:
Rheingold: The new power of collaboration
Fried: Why work doesn't happen at work
Shiv: Sometimes it's good to give up the driver's seat
Riccardi: Cross cultural communication
Johnson: Where good ideas come from
Grady: How to save the world (or at least yourself) from bad meetings

SUBJECT SUPERVISOR

Jolanta Babiak *Jolanta.babiak@pwr.edu.pl*

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Współczesne zarządzanie
Name of subject in English :Contemporary management
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code ZMZ2661
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					**30**
Number of hours of total student workload (CNPS)					**60**
Form of crediting					**crediting with grade**
For group of courses mark (X) final course					
Number of ECTS points					**2**
including number of ECTS points for practical classes (P)					**2**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)					**1,4**

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Essentials of management

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SUBJECT OBJECTIVES

To ensure fundamental knowledge (including application aspects) about:
C1. the context of contemporary business and dynamics of organizational environment,
C2. the idea of business model generation,
C3. problems and principles of strategic choices,
C4. analyzing of business processes,
C5. managing the organizational change,

To ensure fundamental skills to:
C6. choose, justify and apply the management methods and techniques when complex management and substantive issues in the organization are identified, analyzed and solved.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 – student explains and illustrates the impact of global environment on organizational competitiveness and identifies the factors affecting the organizational development.

PEU_W02 – Student recognises the complexity of substantive and managerial problems in the organization. Interprets the interdependencies that go beyond separated functions, processes and organization.
PEU_W03 – Student has knowledge of leadership and decision making in the strategic area and the implementation of organizational changes.

relating to skills:
PEU_U01 - Student analyses the causes and dynamics of events and phenomena in the organization as a whole, in the context of their internal and external conditions.
PEU_U02 – Student has the ability to formulate solutions to complex management and substantive problems in the organization.

relating to social competences:
PEU_K01 – Student shows readiness to unassisted to conduct flexible searches and use critical selection of methods and tools in solving problems arising at the workplace.
PEU_K02 – Presents courage in conveying and defending their views. Prepared to persuade and negotiate in order to achieve common goals.

PROGRAMME CONTENT

Seminar		**Number of hours**
Semin 1	Introduction	2
Semin 2	Modern business environment	2
Semin 3	Entrepreneurship, new ventures, and start-ups	2
Semin 4	New business models and organizational designs	2
Semin 5	New forms of financing and investment opportunities	2
Semin 6	Global production, operations, and supply chain management	2
Semin 7	Online business and technology	2
Semin 8	Marketing processes and consumer behavior in information society	2
Semin 9	Leadership and decision making in knowledge based economy	2
Semin 10	Employee behavior and motivation in liquid modernity	2
Semin 11	Knowledge management, innovation and organizational development	2
Semin 12	Culture and sensemaking	2
Semin 13	Business ethics and social responsibility	2
Semin 15	Change managemnet and the future of management	2
Semin 15	Closing seminar	2
	Total hours	30

TEACHING TOOLS USED

N1. Presentations
N2. Case studies
N3. Discussion
N4. Self-study

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P –	Learning outcomes code	Way of evaluating learning outcomes achievement

concluding (at semester end)		
F1	PEU_W01-W03	Self-study
F2	PEU_W01-W03, PEU_K01-K02	Discussion, Case studies
F3	PEU_U01-U02, PEU_K01-K02	Presentation
P = 0,2*F1 + 0,3*F2 + 0,5 F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bovee C.L., Thill J.V., Business in Action, Global Edition, Pearson 2020
[2] Ebert R.J., Griffin R.W., Business Essentials: Global Edition, Pearson 2019
[3] Barringer B.R., Ireland R.D., Entrepreneurship: Successfully Launching New Ventures, Pearson 2019
[4] Osterwalder A., Pigneur Y., Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Wiley, 2010.
[5] Wilkinson A., Armstrong S.J., Lounsbury M., Oxford Handbook of Management, Oxford University Press, 2018.

SECONDARY LITERATURE:

[1] Hatch M. J., Cunliffe A. L., Organization Theory (3rd edit), 2013.
[2] McKee A., Management: A Focus on Leaders, 2nd Edition, 2014.
[3] Trott P., Innovation Management and New Product Development, Pearson 2017
[4] Hamel G., What matters now. How to win in a world of relentless change, ferocious competition, and unstoppable innovation, Jossey-Bass, 2012.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Adam Dzidowski, adam.dzidowski@pwr.edu.pl

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Zarządzanie projektami
Name of subject in English: Project management
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: obligatory
Subject code ZMZ2662
Group of courses NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**		**30**	**15**	
Number of hours of total student workload (CNPS)	**60**		**60**	**60**	
Form of crediting	**Examination**		**crediting with grade**	**crediting with grade**	
For group of courses mark (X) final course					
Number of ECTS points	**2**		**2**	**2**	
including number of ECTS points for practical classes (P)			**2**	**2**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**1,4**		**1,4**	**1,4**	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Knowledge of basic waterfall project management processes, knowledge of agile project management, skills of defining, planning and controlling a simple project

SUBJECT OBJECTIVES

C1 Provide students with knowledge on methods and approaches of advanced project management
C2 Develop a critical and creative approach to project management, the ability to create tailor-made solutions for project management

SUBJECT EDUCATIONAL EFFECTS

Relating to knowledge:
PEU_W01: The student understands and has knowledge of: advanced methods in project defining, planning, controlling and closing processes
PEU_W02: the student knows portfolio and program management

Relating to skills:
PEU_U01: The student is able to select and use appropriate methods for project, portfolio and program management and to modify them to the current needs

PEU_U02: The student is able to efficiently present project proposals in calls for projects

Relating to social competences:
PEU_K01: the students is able to discuss project management problems and to elaborate a compromise solution in a small group small.
PEU_K02: the students is able to present orally a project proposal in a very short time duration.

PROGRAMME CONTENT

Lecture		**Number of hours**
Lec 1	Contemporary needs in project management	1
Lec 2	Project success definition, criteria and factors	2
Lec 3	Advanced project stakeholders management	2
Lec 4	Advanced project risk management	2
Lec 5	Advanced project cost estimation and control methods	2
Lec 6	Advanced project scheduling and time control methods	2
Lec 7	Project value definition	2
Lec 8	Project metrics	2
	Total hours	**15**

Laboratory		**Number of hours**
Lab 1	Repetition of project planning in MS Project based on small case studies	4
Lab 2	Repetition of measuring and evaluating project progress in MS project, based on small case studies	4
Lab 3	Project programme management in MS Project (master and subprojects)	2
Lab 4	Project programme management in MS Project (resource pools)	2
Lab 5	Custom fields and graphical indicators in MS Project	2
Lab 6	Designing reports in MS Project	2
Lab 7	Formatting in MS Project	2
Lab 8	Simulation of a project case study using MS Project – planning	4
Lab 9	Simulation of a project case study using MS Project – control and closing	4
Lab 10	Application of RISKamp to project risk management	4
Lab 11	Application of system dynamics to project management	4
Lab 12	Final exam	2
	Total hours	**30**

Project		**Number of hours**
Proj 1	Presentation of various calls for projects, formation of groups	1
Proj 2	Presentation of principles of writing project proposals	2
Proj 3	Selection of calls and themes by the groups	2
Proj 4	Presentation of project ideas – project 1	2
Proj 5	Presentations of project proposals – project 1	2
Proj 6	Expert evaluation results of project proposals – project 1	2

Proj 7	Lessons learnt – project 1	2
Proj 8	Oral short presentations of project 1	2
	Total hours	**15**

TEACHING TOOLS USED

TEACHING METHODS

1. theoretical lecture combined with discussion
2. Solving problems and small case studies in groups using Microsoft Project, Excel with RISKamp and Vesima software
3. Presenting project proposals in an oral and written form

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
P	PEU_W01, PEU_W02	Test crediting the lecture
P	PEU_W01	Test crediting the laboratory
F	PEU_K01, PEU_U01	Assessment of students' work during the laboratory
F	PEU_K01, PEU_K02	Assessment of presentations and proposals elaborated during the project

F (forming during semester): A series of written exercises and practical tests offers the teacher and students the opportunity to assess progress and understanding of students, during the course, before the final assessment. Team work during the course will applied and will be evaluated on the basis of oral presentations.

P (concluding): The final exam consists of a written test. The written test is structured to: a) emphasize concepts and techniques acquired during the course; b) request an explanation of the candidate's reasoning; c) allow sufficient time for most well-prepared students to complete each application; d) use innovative types of questions that probe the depth of understanding.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

1. Gray C.F., Larson E.W., Desai G.V. (2013), Project Management, MCGraw Hill
2. Kerzner H. (2005), Advanced Project Management, Helion
3. Kerzner H. (2017), Project Management Metrics, KPIs, and Dashboards: A Guide to Measuring and Monitoring Project Performance, Wiley

SECONDARY LITERATURE:

1. Brzozowska A. (2021), A functional approach to sustainable project management, Taylor and Francis
2. Grucza B. (2019), Zarządzanie interesariuszami projektu, PWE
3. Hoffmann M.R. (2015), How to write effective EU proposals, EU
4. Moustafaev J. (2015), Project scope management, CRC Press
5. Venkataraman R.R., Pinto K.P. (2008), Cost and Value Management in Projects, John Wiley & Sons
6. Wysocki R.K. (2014), Effective Project Management, John Wiley & Sons

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

Prof. dr hab. inż. Dorota Kuchta, DOROTA.KUCHTA@PWR.EDU.PL

Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Planowanie biznesu
Name of subject in English: Business planning
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: optional
Subject code ZMZ2663
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**			**15**	
Number of hours of total student workload (CNPS)	**30**			**30**	
Form of crediting	**crediting with grade**				
For group of courses mark (X) final course	**X**				
Number of ECTS points	**2**				
including number of ECTS points for practical classes (P)				**1**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**1,4**				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of management.

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SUBJECT OBJECTIVES

C1 An acquaintance with principles of a business plan's preparation and presentation.
C2 Consolidation and practical application of knowledge about law and administrative business regulations.
C3 Training in a specific application of knowledge about strategic analysis, marketing planning and financial planning.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 Identifies inter-organizational relations and interactions of the organization with the environment. Explains and illustrates the impact of the environment on the activities of the organization when developing a business plan.
PEU_W02 Has extended and in-depth substantive knowledge of the organization and operation of an enterprise necessary for running a business.

PEU_W03 Knows and understands the norms and standards (economic, legal, organizational and ethical) for establishing and running a business.
PEU_W04 Knows and understands the concepts, theories, methods and instruments in the field of economic and legal policy used to start and run a business.
relating to skills:
PEU_U01 Is able to use the acquired knowledge in the selection of sources and information necessary to create a business plan.
PEU_U02 Has the ability to analyze the causes and dynamics of phenomena in the organization's environment in the conditions of the market economy and the applicable economic and legal regulations in order to create a business plan and implement it.
PEU_U03 Is able to analyze and evaluate the goals, features, elements, processes, functional areas in the enterprise as well as internal and inter-organizational relations in creating a business plan.
PEU_U04 Is able to use the acquired knowledge to analyze economic phenomena and solve economic problems as well as adapt, justify and apply appropriate norms and standards (economic, legal, social) in the preparation and implementation of a business plan.
relating to social competences:
PEU_K01
Is aware of the need for an independent, critical assessment of the scope and level of their knowledge of establishing and running a business Is prepared to independently search for areas of knowledge to supplement and skills to improve.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Entrepreneurship, sources of business ideas, business plan (structure and content).	2
Lec 2	Economic activity - legal framework. Procedure for starting a business.	2
Lec 3	Methods for analyzing the macro-environment.	2
Lec 4	Methods for analyzing the micro-environment and the company's potential. Business environment institutions.	2
Lec 5	Financial statements and indicators.	2
Lec 6	Sources of financing economic ventures.	2
Lec 7	Business plan implementation.	2
Lec 8	Written test.	1
	Total hours	15

Project		**Number of hours**
Proj 1	Introduction	1
Proj 2	The choice of the business enterprise’s scope and form – presentations and discussion.	2
Proj 3	Micro-environment of the companies analysis – presentations and discussion.	2

Proj 4	Macro-environment of the companies analysis – presentations and discussion.	2
Proj 5	The plan of marketing activities – presentations and discussion.	2
Proj 6	Financial needs' forecast – presentations and discussion.	2
Proj 7-8	Projects' acceptance and presentations.	4
	Total hours	15

TEACHING TOOLS USED
N1. multimedia presentation N2. presentation of sub-tasks N3. discussion N4. project presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01-W04	Written test
F2	PEU_U01-U03	Assessment of the presentation of sub-tasks
F3	PEU_U04	Assessment of preparation for discussion
F4	PEU_K01 PEU_U04	Project defense
P = F1+ F4 + F3 + F2 F1 up to 40 points, F4 up to 40 points, F3 up to 10 points, F2 up to 10 points 91-100 points = 5.0 81-90 points = 4.5 71-80 points = 4.0 61-70 points = 3.5 51-60 points = 3.0 0-50 points = 2.0		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Berry, T. (2006). Hurdle: the book on business planning: How to develop and implement a successful business plan. Palo Alto Software, Inc.

[2] David, F., & David, F. R. (2020). Strategic management: A competitive advantage approach, concepts and cases.

[3] Schwetje, G., & Vaseghi, S. (2007). The business plan: how to win your investors' confidence. Springer Science & Business Media.

SECONDARY LITERATURE:

[1] Schramm, C. J. (2018). Burn the Business Plan: What Great Entrepreneurs Really Do. Simon and Schuster.
[2] Fiore, F. (2005). Write a business plan in no time. Que publishing.

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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Modele biznesowe w rozwijającym się otoczeniu
Name of subject in English: Business models in a developing environment
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: optional
Subject code ZMZ2664
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**			**15**	
Number of hours of total student workload (CNPS)				**60**	
Form of crediting				**crediting with grade**	
For group of courses mark (X) final course				**X**	
Number of ECTS points				**2**	
including number of ECTS points for practical classes (P)				**1**	
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)				**1,4**	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the basics of entrepreneurship.
2. Knowledge of the basics of management.

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SUBJECT OBJECTIVES

O1 Knowledge of basic business models.
O2. Knowledge of the organizational environment analysis process
O3 The ability to identify changes taking place in the environment and to select an appropriate business model

SUBJECT EDUCATIONAL EFFECTS

In the field of knowledge:

PEU_W01 Identifies inter-organizational relations and interactions of an organization with the environment in the context of national, international and intercultural conditions. Explains and illustrates the impact of the environment on the activities of the organization.

PEU_W02 Has extended and deepened substantive knowledge on the organization and functioning of the company in the field of strategic management, logistics, marketing, finance, business architecture.

PEU_W03 Knows and understands the norms and standards (economic, legal, organizational and ethical) that determine the context of the functioning of the economy and organization.

In the field of skills:

PEU_U01 Is able to analyze and evaluate the objectives, features, elements, processes, functional areas in the enterprise as well as internal and inter-organizational relations, using concepts and theoretical approaches in the field of social sciences, in particular the discipline of management and quality science.

PEU_U02 Is able to formulate innovative alternative solutions to management and substantive problems in the enterprise. He can justify, make a choice and verify them in accordance with the established priorities. Can plan actions to solve them.

Relating to social competences:

PEU_K01

Is aware of the need for an independent, critical assessment of the scope and level of their knowledge of establishing and running a business Is prepared to independently search for areas of knowledge to supplement and skills to improve.

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Analysis of the organization's environment and its impact on the choice of the business model.	2
Lec 2	Definition and concept of the business model. Evolution of business models and examples of their classification.	2
Lec 3	Business models - review of literature proposals and their essence isolation. Common business models, analysis and known examples of their application.	2
Lec 4	The business model and the company's strategy. Determinants of choosing a business model.	2
Lec 5	Basic principles of designing and introducing changes in the business model - characteristics of the elements of business models by industry	2
Lec 6	A business model as a tool for implementing a business plan. Lean canvas as a tool for building an innovative business model.	3
Lec 7	A culture of flexible organization.	1
Lec 8	Test	1
	Total hours	15

Project		**Number of hours**
Proj 1	Introduction.	1
Proj 2	Identifying business models - case study.	2
Proj 3	Modernization of the functioning business model - case study.	2
Proj 4	Selection of the project entity, diagnosis of the organization.	2
Proj 5	Analysis of the environment of the studied organization - presentation.	2
Proj 6	Proposed variants of a new business model, impact forecast - presentation, discussion.	2
Proj 7-8	Final presentations.	4
	Total hours	15

TEACHING TOOLS USED
N1. multimedia presentation N2. presentation of sub-tasks N3. project presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 PEU_W02 PEU_W03	Written test
F2	PEU_U01 PEU_U02	Assessment of the presentation of sub-tasks
F3	PEU_U01 PEU_U02	
F4	PEU_K01	Project defense
P = F1*0,5+ (0,4*F2+0,3*F3+0,3*F4)*0,5		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Osterwalder A., Pigneur Y. (2010), Business Model Generation, John Wiley & Sons [2] Muehlhausen J. (2018) Business Models For Dummies, John Wiley & Sons [3] Allen M. (2001) Analysing the Organisational Environment, Select Knowledge **SECONDARY LITERATURE:** [1] Johnson, M.W., Christensen, C. (2008). Reinventing your business model. Harvard Business Review, 86(12), 51–59 [2] Linder, J., Cantrell, S. (2000). Changing business models: Surveying the landscape. Institute for Strategic Change working paper, Accenture [3] Rappa, M. Business models on the Web. http://digitalenterprise.org/models/ models.html
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Zał. nr 5 do ZW 16/2020

FACULTY OF MANAGEMENT

SUBJECT CARD

Name of subject in Polish: Społeczna odpowiedzialność biznesu
Name of subject in English: Corporate Social Responsibility
Main field of study (if applicable): Business Engineering
Specialization (if applicable): Business Intelligence
Profile: academic
Level and form of studies: 2nd level, full-time
Kind of subject: optional
Subject code ZMZ2665
Group of courses YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	**15**				**15**
Number of hours of total student workload (CNPS)	**30**				**30**
Form of crediting	**crediting with grade**				
For group of courses mark (X) final course	**X**				
Number of ECTS points	**2**				
including number of ECTS points for practical classes (P)					**1**
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	**1,4**				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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SUBJECT OBJECTIVES

C1. To deliver the basic conceptual foundations of corporate social responsibility
C2. To explore main issues and challenges typically encountered by the company in managing social responsibilities in relations with different stakeholders.
C3. To encourage making thoughtful judgments when faced with social responsibilities in business practice.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEU_W01 - has a basic knowledge about corporate social responsibility agenda and perspectives
PEU_W02 - has a basic knowledge about managing corporate social responsibility
PEU_W03 – understands main issues and challenges typically encountered by the company in managing social responsibilities in relations with different stakeholder groups

relating to skills:

PEU_U01 – identifies, analyzes and evaluates application of CSR in relations with different stakeholder groups
PEU_U02 – identifies and analyzes main issues and challenges typically encountered by the company in CSR management

relating to social competences:
PEU_K01 – is prepared to behave in a professional and ethical manner, to recognize and formulate the ethical dilemmas associated with his/her own and others' work; to seek appropriate solutions and opportunities to correct deficiencies in their attitudes and behaviors in the workplace

PROGRAMME CONTENT		
Lecture		**Number of hours**
Lec 1	Corporate Social Responsibility agenda	2
Lec 2	Perspectives on CSR. The business case for CSR	2
Lec 3	Actors and drivers of CSR	2
Lec 4	Managing CSR: Corporate Governance and CSR	2
Lec 5	Managing CSR: Developing CSR strategy	2
Lec 6	Managing CSR: CSR reporting and auditing CSR	2
Lec 7	Managing CSR: Responsibility in supply chain. Partnerships and self-Regulation	2
Lec 8	Final assessment	1
	Total hours	15

Seminar		**Number of hours**
Semin 1	Organizational meeting	1
Semin 2	Applying CSR in the marketplace	2
Semin 3	Applying CSR in the workplace	2
Semin 4	Applying CSR in the community	2
Semin 5	Applying CSR and the ecological environment	2
Semin 6	Developing CSR strategy – case study	2
Semin 7	CSR reporting and auditing CSR – case study	2
Semin 8	Partnerships and self-Regulation – case study	2
	Total hours	15

TEACHING TOOLS USED
N1. Multimedia presentations N2. Case studies N3. Students’ presentations

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01-W03	written assessment
F2	PEU_U01-U02, PEU_K01	students' presentation
F3	PEU_U01-U02, PEU_K01	students' involvement during case study solving
P= 0,5*F1+0,4*F2+0,1*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Crane, A., McWilliams, A., Matten, D., Moon, J., & Siegel, D. S. (Eds.), The Oxford handbook of corporate social responsibility, Oxford Handbooks, 2008.
[2] Blowfield M., Murray A., Corporate social responsibility, OXFORD University Press, 2019.

SECONDARY LITERATURE:

[1] Crane, A., Matten, D., & Spence, L. (Eds.), Corporate social responsibility: Readings and cases in a global context, Routledge, 2019.
[2] Chrysides G.D., Kaler J.H.: Essentials of business ethics, McGrawhill, 1996.
[3] Crane A., Matten D., Glozer, S., & Spence, Business Ethics: Managing Corporate Citizenship and Sustainability in the Age of Globalization, Oxford University Press, 2019.
[4] Ferrell O. C., Business ethics: ethical decision making and cases, Houghton Mifflin Co., New York 2005.
[5] Gini A. [ed.], Case studies in business ethics, Pearson Pretice Hall, Upper Saddle River 2005.
[6] Giacalone R.A., Jurkiewicz C.L., Dunn C. [ed.], Positive psychology in business ethics and corporate responsibility, Information Age Pub., Greenwich 2005.
[7] Murphy P.E., Laczniak G.R., Marketing ethics: cases and readings, Pearson Prentice Hall, Upper Saddle River 2006.
[8] Sternberg E.: Just Business, Oxford University Press, New York 2002.
[9] Journals like "Journal of Business Ethics".

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