Zał. nr 2 do UCHWAŁY Nr 176/2022/2023 Senatu PCz

POLITECHNIKA CZĘSTOCHOWSKA

CZESTOCHOWA UNIVERSITY OF TECHNOLOGY

CURRICULUM

field of study: MATERIALS DESIGN AND LOGISTICS

Education cycle commencing

from the academic year 2023/2024

Level: first-cycle degree programme

Profile: general academic

Form of study: full-time

Degree: Inżynier

1. General characteristics of the field of study.

Basic information about the field of study	
Name of the field of study:	Materials design and logistics
Level:	first-cycle degree programme, level 6 of the Polish Qualifications Framework
Profile:	general academic
Form(s) of study:	full-time
Number of semesters:	7
ISCED classification:	0719
Total number of ECTS points required to complete the degree programme at a given level:	210
Total number of class hours required to complete the degree programme:	2729
Degree awarded to the graduate:	Inżynier
Field of study coordinator: Renata Caban, MScEng, PhD	

Scientific areas and disciplines to which the learning outcomes refer			
	Area	**Discipline**	**% Share (total figures)**
Leading discipline (more than 50% of learning outcomes ascribed):	**Engineering and Technical Sciences**	**Materials engineering**	**66**
Additional scientific discipline to which the learning outcomes refer:	**Social Sciences**	**Management and quality sciences**	**34**

2. A graduate profile covering a description of the overall objectives of the degree programme and the employment and postgraduate opportunities for graduates.

A characteristic feature of the contemporary labour market is its intensive development. The management methods used are constantly evolving to increase their effectiveness and provide greater control over the processes carried out. Particularly important is the appropriate planning, implementation and control of logistics processes leading to the rapid movement of resources in such a way that they are available at the right time, place and in the right quantity. Changes in management are accompanied by changes in technical issues. Intense economic as well as social changes, defined in the broad sense as sustainable development, lead to the evolution of materials, necessitating improvements in their properties. Materials design and logistics degree programme is a response to the market expectations, where the role of specialists with broad engineering competences, combining organisational and management skills with technical knowledge, is increasing. Graduates of the Materials design and logistics degree programme of a general-academic profile, having gained knowledge of engineering materials (metallic, ceramic, polymer and composite materials) combined with logistics knowledge, possess a set of skills highly sought after by employers. Graduates are familiar with materials manufacturing/processing technologies, the relationship between their structure and properties and testing methods. The acquired knowledge of the functioning of modern logistics systems, the basics of economic sciences, organisation and management, as well as managerial skills, allow graduates to be employed in many social and economic sectors. In addition, graduates possess knowledge of how to select engineering materials for various applications and the ability to use computer-aided materials design. They are familiar not only with the theoretical foundations of logistics, but also with its practical applications and tools: computer programmes and information technology. Having mastered a minimum of one foreign language at level B2 of the Council of Europe's Common European Framework of Reference for Languages (specialised and professional vocabulary), they also possess language skills. Graduates of Materials design and logistics degree programme are able to identify logistics problems while their knowledge of materials engineering enables them to recommend replacement or improvement solutions. As a result, graduates can be employed as specialists and managers in companies, as well as in organisations specialising in the design of logistics systems and processes. The ability to solve practical problems, basic knowledge of management theory, aspects of production organisation and quality management system standards make graduates prepared to take up employment in large, medium and small industrial enterprises involved in the production and processing of engineering materials and logistics. In addition, the graduate is ready to cooperate with

engineers of other specialisations. This professional preparation enables the graduate of the Materials design and logistics degree programme to be employed in industry, energy, transportation sectors, scientific institutions, consulting and design offices, crafts and trade as well as private manufacturing and service companies.

The acquired knowledge allows graduates to pursue a second-cycle degree programme in Materials Engineering, Production Management and Engineering, Engineering Logistics as well as many other programmes at technical universities in Poland and abroad.

3. Parametric characteristics of the field of study.

Summary indicators characterising the curriculum		
Indicator description	**Number of hours**	**ECTS points**
Number of hours of classes within the degree programme taught by teachers employed at the University as the primary place of work	**2729**	**-**
The number of ECTS points which a student must obtain in a foreign language course	**-**	**8**
Length of work placement and number of ECTS points a student must obtain for the placement	**100**	**4**
Number of ECTS points in the leading discipline	**-**	**138**
Total number of ECTS points which the student must obtain in courses with the direct involvement of academic teachers or other instructors.	**-**	**107**
Number of ECTS points which the student must obtain in courses in humanities or social sciences (a minimum of 5 ECTS points) for fields of study which are assigned to disciplines within areas other than, respectively, humanities or social sciences	**-**	**77**
Number of ECTS points which the student must obtain in elective courses	**-**	**63**
Number of hours of physical education classes to which neither learning outcomes nor ECTS points are allocated	**60**	**-**
Number of ECTS points allocated to practical skills courses	**-**	**42**

For degree programmes of a general academic profile: -the number of ECTS points allocated to courses related to the academic activity conducted at the University in the discipline or disciplines to which the field of study is assigned, -the number of ECTS points allocated to courses preparing students for scientific research or participation in scientific research.	- -	**184** **184**
For degree programmes of a practical profile: The number of ECTS points allocated to courses developing practical skills	-	

4. Description of the principles and forms of student placements.

Full-time students of the first-cycle degree programme in Materials design and logistics are required to complete a 4-week work placement in the fourth semester of study. In accordance with § 3 (1) (8) and § 17 (1) (4) of the Study Regulation, work placements are undertaken by students in various institutions, including companies where the students improve their practical skills acquired in the course of their study. The primary objective of the work placement is to complement the theoretical knowledge acquired during the educational classes included in the study schedule with the principles observed in enterprises/institutions. The objective, dates of the work placement, the scope of the tasks performed, the requirements and method of completing the work placement for a given field of study are included in the Work Placement syllabus (WIP-MDL-D1-EP-04), available on the website of the Faculty of Production Engineering and Materials Technology.

A week of work placement is considered to be an average of at least 5 hours per day, with a 5-day working week. The work placement is included in the study schedule and the curriculum and is treated as a fully-fledged subject, the completion of which results in an entry in the course record and which may be subject to a course evaluation survey in accordance with the existing university procedure PU2 Course evaluation survey. The work placement on the Materials design and logistics degree programme should be carried out during the summer break (in the months of July, August and September).

Supervision over work placements is exercised by the Placement Representative appointed by the Dean of the Faculty of Production Engineering and Materials Technology and by work placement supervisors of the given field of study. Work placements are undertaken by students in various entities, including enterprises, companies and other business entities in the vicinity of the student's place of residence or the university seat, and are designed to improve students' practical skills acquired in the course of study. Students of the Materials design and logistics degree programme may choose their own placement location, following approval of the location selected by the student by the Dean's

Representative for Work Placements.

The student undergoing the placement shall record work placement history in the placement logbook. Upon completion of the placement, in order to be awarded credit for the work placement, the student is obliged to submit to the placement supervisor the placement logbook and the institution's assessment of the student completing the placement. For successful completion of the placement, the student is awarded 4 ECTS points, added to the total number of points.

Detailed procedures for the completion of work placements are included in the Faculty Quality of Education Handbook, which describes the principles for the organisation of work placements, the conditions and deadlines for their completion, designating the person making the final entry in the course record and transcript of academic record.

5. A schedule of curriculum implementation (teaching grid) broken down into semesters and years of the study cycle, indicating the elective modules and the study areas.

Curriculum implementation, Field of study: MATERIALS DESIGN AND LOGISTICS										
Subject code	**Year of study: 1, semester 1**	**Number of hours**					**Total**	**ECTS**	**Exam**	**Object status***
		Lecture	**Classes**	**Labor.**	**Seminar**	**Project**				
WIP-MDL-D1-TSAHE-01	Training on safe and hygienic education conditions	4					4	0		O
WIP-MDL-D1-SL-01	Supply logistics	15	15				30	2		K
WIP-MDL-D1-OHAS-01	Occupational health and safety	15					15	1		P
WIP-MDL-D1-BOCS-01	Basics of computer science	15		15			30	2		P
WIP-MDL-D1-BOOAM-01	Basis of organization and management	15	15				30	2		P
WIP-MDL-D1-MAT-01	Mathematics	15	15				30	2		P
WIP-MDL-D1-IPP-01	Intellectual property protection	15					15	1		O
WIP-MDL-D1-EB-01	Economy basics	15	30				45	5	e.	P
WIP-MDL-D1-MCH-01	Materials chemistry	30	15	15			60	5		P
	Offer 1									
WIP-MDL-D1-TIOTC-01	The impact of the company on the environment	15	30				45	4		O, W
WIP-MDL-D1-SD-01	Sustainable development									
	Offer 2									
WIP-MDL-D1-MS-01	Materials science	30	15	30			75	6	e.	K, W
WIP-MDL-D1-EM-01	Engineering materials									
	Total for the semester	**184**	**135**	**60**	**0**	**0**	**379**	**30**	**2**	

Subject code	Year of study: 1, semester 2	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-QM-02	Quality management	15	15				30	2		K
WIP-MDL-D1-TBOCD-02	The basics of CAD design					30	30	2		P
WIP-MDL-D1-BOCS-02	Basics of commodity science	15	15				30	3		P
WIP-MDL-D1-PE-02	Physical education I		30				30	0		O
WIP-MDL-D1-MAT-02	Mathematics	15	15				30	3	e.	P
WIP-MDL-D1-SCAN-02	Social communication and negotiations	15	15				30	2		K
WIP-MDL-D1-MFTEI-02	Materials for the electronics industry	15		15			30	2	.	K
WIP-MDL-D1-EP-02	Engineering physics	30	15	15			60	5	e.	P
WIP-MDL-D1-PL-02	Production logistics	15	6			9	30	3		K
	Offer 3									
WIP-MDL-D1-MMAT-02	Modern materials and technologies	15		15			30	3		K, W
WIP-MDL-D1-NGM-02	New generation materials									
	Offer 4									
WIP-MDL-D1-MOMI-02	Methods of materials investigation	15		30			45	5	e.	K, W
WIP-MDL-D1-IOR-02	Instrumentation of research									
	Total for the semester	**150**	**111**	**75**	**0**	**39**	**375**	**30**	**3**	

Subject code	Year of study: 2, semester 3	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-PE-03	Physical education II		30				30	0		O
WIP-MDL-D1-EL-03	Ecologistics	15	15				30	3		K
WIP-MDL-D1-MM-03	Metallic materials	30		30			60	6	e.	K
WIP-MDL-D1-CM-03	Ceramic materials	30		30			60	4		K
WIP-MDL-D1-SM-03	Strategic management	15	30				45	4	e.	K
WIP-MDL-D1-DADM-03	Databases and Data Mining			30			30	3		K
WIP-MDL-D1-FL-03	Foreign language		30				30	2		O, W
	Offer 5									
WIP-MDL-D1-SMIES-03	Statistical methods in engineering sciences	15	15				30	3		K, W
WIP-MDL-D1-ES-03	Engineering statistics									
	Offer 6									
WIP-MDL-D1-BOAAR-03	Basics of automation and robotics	15	15	15		15	60	5		K, W
WIP-MDL-D1-MW-03	Modern warehouses									
	Total for the semester	**120**	**135**	**105**	**0**	**15**	**375**	**30**	**2**	

Subject code	Year of study: 2, semester 4	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-PDOM-04	Process design of materials	15				30	45	4	e.	K
WIP-MDL-D1-MAMR-04	Marketing and marketing research	15	15				30	2		K
WIP-MDL-D1-PAPIS-04	Packaging and product identification systems	15		15			30	2		K
WIP-MDL-D1-PM-04	Polymer materials	30		15			45	3		K
WIP-MDL-D1-COM-04	Composites	30		30			60	3		K
WIP-MDL-D1-LC-04	Logistics centres	15	15				30	2	e.	K
WIP-MDL-D1-ELC-04	Enterprise logistics costs	15	15				30	3		K
WIP-MDL-D1-FL-04	Foreign language		30				30	2		O, W
	Offer 7									
WIP-MDL-D1-DAMOP-04	Design and manufacture of products in 3D printing technology	15		30			45	3		K, W
WIP-MDL-D1-MOPWT-04	Manufacture of products with the use of incremental methods									
	Offer 8									
WIP-MDL-D1-PM-04	Personnel management	15	15				30	2		K,W
WIP-MDL-D1-DOM-04	Developing of management									
WIP-MDL-D1-EP-04	Engineering practice						100	4		K, W
	Total for the semester	**165**	**90**	**90**	**0**	**30**	**475**	**30**	**2**	

Subject code	Year of study: 3, semester 5	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-ERM-05	Enterprise resource management	15	15			15	45	3		K
WIP-MDL-D1-PD-05	Product design	15				30	45	4		K
WIP-MDL-D1-LOD-05	Logistics of distribution	15	15				30	3	e.	K
WIP-MDL-D1-FL-05	Foreign language		30				30	2		O, W
	Offer 9									
WIP-MDL-D1-WPM-05	Work process management	15	15				30	3	e.	K, W
WIP-MDL-D1-OAMOP-05	Organization and management of production processes									
WIP-MDL-D1-LI-05	Logistics infastructure	15	15				30	2		K
WIP-MDL-D1-MMT-05	Modern manufacturing techniques	30		30		30	90	7		K
WIP-MDL-D1-RADP-05	Reporting and data presentation	15		30			45	4		K
WIP-MDL-D1-TI-05	Transport infrastructure	15	15				30	2		K
	Total for the semester	**135**	**105**	**60**	**0**	**75**	**375**	**30**	**2**	

Subject code	Year of study: 3, semester 6	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-LM-06	Lean management	15	15			15	45	3		K
WIP-MDL-D1-FL-06	Foreign language		30				30	2	e.	O, W
WIP-MDL-D1-RPT-06	Rapid prototyping technologies	30		15		15	60	5		K
WIP-MDL-D1-DAMS-06	Design and materials selection	30		30			60	4		K
WIP-MDL-D1-TEOTO-06	The efficiency of the organization's functioning	15	15				30	3		K
WIP-MDL-D1-IACT-06	Information and communication technologies in logistics	15	15				30	2		K
WIP-MDL-D1-LPM-06	Logistic project management	15				15	30	2		K
WIP-MDL-D1-SOMP-06	Shaping of materials properties	15		15			30	4	e.	K
	Offer 10									
WIP-MDL-D1-OR-06	Operational research	15		15			30	2		K, W
WIP-MDL-D1-QMIM-06	Quantitative methods in management									
	Offer 11									
WIP-MDL-D1-KM-06	Knowledge management	15	15				30	3		K, W
WIP-MDL-D1-ICM-06	Intellectual capital management									
	Total for the semester	**165**	**90**	**75**	**0**	**45**	**375**	**30**	**2**	

Subject code	Year of study: 4, semester 7	Number of hours					Total	ECTS	Exam	Object status*
		Lecture	Classes	Labor.	Seminar	Project				
WIP-MDL-D1-PFTT-07	Preparation for the thesis and diploma examination						0	10		W
WIP-MDL-D1-DS-07	Diploma seminar				30		30	1		K
WIP-MDL-D1-TPOP-07	Technical preparation of production	30	15			15	60	4		K
WIP-MDL-D1-MR-07	Materials recycling	15	30				45	2		K
WIP-MDL-D1-ACPD-07	Anti-corrosion protective design	15		15			30	2		K
WIP-MDL-D1-IL-07	International logistics	15	15				30	2		K
WIP-MDL-D1-DOM-07	Degradation of materials	30		30			60	3		K
WIP-MDL-D1-LISIM-07	Logistic IT systems in manufacturing companies	15	30				45	2		K
WIP-MDL-D1-COTAW-07	Computerization of transport and warehouse processes	15		30			45	2	e.	K
	Offer 12									
WIP-MDL-D1-EE-07	Engineering ethics	15			15		30	2		K, W
WIP-MDL-D1-COEAC-07	Creativity of employees and creative teams									
	Total for the semester	**150**	**90**	**75**	**45**	**15**	**375**	**30**	**1**	
	Total sem.1 ÷ 7	**1069**	**756**	**540**	**45**	**219**	**2729**	**210**		

*O - general subject, P - basic subject, K - major subject, W - elective subject

6. Description of learning outcomes for the field of study: Materials design and logistics

Level and form of study:	*first-cycle*	*full-time*		
Profile:	*general academic*			
Code of the relevant learning outcome	Description of the relevant learning outcome	Code of the universal first-cycle descriptor for *) level	Code of the second-cycle descriptor of the learning outcomes for **) qualification level	Code of the second-cycle descriptor of the learning outcomes for an engineering qualification***)
		6	6	6
A graduate with *first-cycle* qualification*:*				
in terms of knowledge				
K_W01	has a basic knowledge of selected branches of mathematics, statistics, physics, chemistry, materials engineering, logistics, as well as humanities.	P6U_W	P6S_WG	P6S_WG
K_W02	is familiar with the principles of the production system, understands its mechanisms, has knowledge of logistics and its subsystems, as well as supply chain management.	P6U_W	P6S_WK	P6S_WK
K_W03	knows the basic methods, techniques and tools used to solve engineering tasks, knows the methods for measuring basic physical quantities and the methodology for processing measurement results, is familiar with the methods of data presentation.	P6U_W	P6S_WG	P6S_WG
K_W04	knows and understands the methods used to shape the structure and properties of modern engineering materials, knows their structure, the principles of materials selection and design, knows the fundamentals of commodities, has a basic knowledge of	P6U_W	P6S_WG	P6S_WG

	development trends of modern engineering materials, research methods, and materials production, processing and recycling technologies.			
K_W05	knows and understands the capabilities of computer modelling and computer aided design systems using specialized software, has a basic knowledge of automation and robotics.	P6U_W	P6S_WG	P6S_WG
K_W06	knows and understands the current trends in the development of logistics, knows the impact of specific logistics processes on the environment, also in the ecological and social context.	P6U_W	P6S_WG	P6S_WG
K_W07	has a general knowledge of economics, marketing and fundamentals of company management, knows and understands contemporary market mechanisms, is familiar with methods and techniques for company resource management, understands the interrelationships and mechanisms between different areas of company operation, knows basic systems, methods, techniques and tools used in quality management.	P6U_W	P6S_WK	P6S_WK
K_W08	has a basic knowledge of legal acts and norms regulating business activity, knows and understands the principles of the functioning of the organisation and the basic principles of organisation management, the company's market activities, project management, environmental management, principles of occupational health and safety and other aspects of engineering activity, knows and understands the concepts and	P6U_W	P6S_WG P6S_WK	P6S_WG P6S_WK

	principles of intellectual property protection.			
K_W09	knows and understands the grammatical rules and vocabulary of a foreign language, both general and specialised, specific to the scientific areas and disciplines relevant to the field of study, in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages.	P6U_W	P6S_WK	
in terms of skills				
K_U01	has language skills specific to the scientific areas and disciplines relevant to the field of study, in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages.		P6S_UK	
K_U02	is able to demonstrate specialized movement skills in selected forms of physical activity.		P6S_KO	
K_U03	is able to use analytical, simulation and experimental methods and physical and chemical phenomena to formulate and solve tasks related to the design of modern technologies for materials production, their processing and recycling, is able to interpret the results obtained and draw appropriate conclusions.	P6U_U	P6S_UW P6S_UO P6S_UU	P6S_UW
K_U04	is able to select and correctly apply appropriate methods, tools, techniques, computer programs, materials and normative systems in identifying, specifying and solving engineering tasks and problems in the field of materials engineering and logistics while	P6U_U	P6S_UW	P6S_UW

	recognising systemic and non-technical aspects, including ethics, and is able to evaluate solutions and design improvements for professional purposes.			
K_U05	is able to select and use advanced information and communication techniques when planning, designing and carrying out engineering tasks in the field of materials engineering and logistics, is able to apply IT solutions to improve aspects of the production system, interpret the results obtained and formulate conclusions, independently and in a team.	P6U_U	P6S_UW P6S_UO	P6S_UW
K_U06	is able to evaluate the use of tangible and intangible company assets and manage them properly in existing and planned production systems, is able, considering the ecological aspect, to select appropriate materials and to use suitable production techniques and processes in the production relevant to the given field of study.	P6U_U	P6S_UW	P6S_UW P6U_U
K_U07	is able to identify and analyze the phenomena and processes occurring in organizations and their environment relevant to their field of study, as well as recognize social and economic aspects.	P6U_U		
K_U08	correctly uses normative systems and selected standards and rules in order to solve a specific task in the scientific areas and disciplines relevant to the field of study.	P6U_U	P6S_UW	P6S_UW
K_U09	can obtain information from the right sources, also in a foreign language, as well as integrate, interpret and draw conclusions	P6U_U	P6S_UW P6S_UK P6S_UU	P6S_UW

	based on evaluation, critical analysis and synthesis of information, has the ability to prepare written assignments and deliver presentations, in Polish and a foreign language, formulate and justify opinions by taking part in debates, independently plan and implement their own lifelong learning.			
in terms of social competences				
K_K01	is aware of the importance of non-technical aspects and consequences of engineering activity, including its impact on the environment, and of the related responsibility for decisions taken.	P6U_K	P6S_KK	
K_K02	has the ability to make decisions independently and to set priorities in order to accomplish a task assigned by him/herself or by others, and is ready to interact and work in a team, assuming different roles.	P6U_K	P6S_KK	
K_K03	knows the general principles for the establishment and development of self-employment types and is able to think and act creatively, is able to communicate effectively, debate, persuade and negotiate in order to achieve the set goals.	P6U_K	P6S_KO	P6S_KO
K_K04	understands the need to communicate to the public - including through the mass media - information about the technological developments and other aspects of the engineering activity, and is able to convey such information in a universally understandable manner, is ready to cooperate in an international team for the development of common solutions; understands the need for lifelong learning -	P6U_K	P6S_KO	

	improving their professional and personal competences, using a foreign language for this purpose as well.			

*) Code of the universal first-cycle descriptor for level 6 or 7, provided in the Annex to the Act of 22 December 2015 on the Integrated Qualification System.

**) Code of the second-cycle descriptor of the learning outcomes for 6 or 7 qualification level, provided in the Annex to the Regulation of the Minister of Science and Higher Education of 14 November 2018 on second-cycle descriptors of learning outcomes for 6-8 qualifications levels of the Polish Qualifications Framework.

***) Applicable only to fields of study leading to engineering qualifications – code of the second-cycle descriptor of the learning outcomes for engineering qualifications, provided in the Annex to the Regulation of the Minister of Science and Higher Education of 14 November 2018 on second-cycle descriptors of learning outcomes for 6-8 qualifications levels of the Polish Qualifications Framework.

7. Matrix of learning outcomes for the field of study.

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-TSAHE-01								x											x			
WIP-MDL-D1-SL-01		x			x	x				x	x			x					x	x		
WIP-MDL-D1-OHAS-01								x											x			
WIP-MDL-D1-BOCS-01	x												x									
WIP-MDL-D1-BOOAM-01							x	x								x						
WIP-MDL-D1-MAT-01	x									x										x		
WIP-MDL-D1-IPP-01								x	x						x		x		x			
WIP-MDL-D1-EB-01	x						x	x								x	x				x	
WIP-MDL-D1-MCH-01	x		x	x								x	x					x	x	x		
WIP-MDL-D1-TIOTC-01	x		x					x		x		x			x				x	x		
WIP-MDL-D1-SD-01	x					x	x	x					x		x		x		x	x	x	
WIP-MDL-D1-MS-01	x		x										x	x						x	x	
WIP-MDL-D1-EM-01	x		x										x	x						x	x	

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-QM-02							x						x									
WIP-MDL-D1-TBOCD-02			x										x							x		
WIP-MDL-D1-BOCS-02	x			x									x				x		x			
WIP-MDL-D1-PE-02											x								x			
WIP-MDL-D1-MAT-02	x									x										x		
WIP-MDL-D1-SCAN-02							x									x					x	
WIP-MDL-D1-MFTEI-02	x		x	x								x						x	x	x		
WIP-MDL-D1-EP-02	x		x									x										
WIP-MDL-D1-PL-02		x			x								x							x		
WIP-MDL-D1-MMAT-02			x	x								x								x		
WIP-MDL-D1-NGM-02	x		x	x								x	x	x					x	x		x
WIP-MDL-D1-MOMI-02	x		x	x													x	x	x			
WIP-MDL-D1-IOR-02	x		x	x													x		x			
WIP-MDL-D1-PE-03											x								x			

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-EL-03	x	x		x		x	x						x		x	x			x	x		
WIP-MDL-D1-MM-03	x			x								x								x		
WIP-MDL-D1-CM-03	x		x	x								x	x	x					x	x		x
WIP-MDL-D1-SM-03							x									x				x		
WIP-MDL-D1-DADM-03			x										x	x						x		
WIP-MDL-D1-FL-03									x	x								x				x
WIP-MDL-D1-SMIES-03	x		x										x	x						x		
WIP-MDL-D1-ES-03	x		x										x	x						x		
WIP-MDL-D1-BOAAR-03			x		x							x	x	x	x		x	x		x		
WIP-MDL-D1-MW-03		x	x		x								x	x				x		x		
WIP-MDL-D1-PDOM-04		x											x									
WIP-MDL-D1-MAMR-04							x						x									
WIP-MDL-D1-PAPIS-04		x	x			x	x				x		x			x			x	x		x
WIP-MDL-D1-PM-04			x	x	x							x					x	x		x	x	

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-COM-04				x								x								x		
WIP-MDL-D1-LC-04	x	x				x	x	x	x							x	x		x	x	x	x
WIP-MDL-D1-ELC-04		x				x	x									x		x		x	x	
WIP-MDL-D1-FL-04									x	x								x				x
WIP-MDL-D1-DAMOP-04	x												x									
WIP-MDL-D1-MOPWT-04	x												x									
WIP-MDL-D1-PM-04							x									x				x		
WIP-MDL-D1-DOM-04							x									x				x		
WIP-MDL-D1-EP-04			x	x	x	x							x	x	x	x			x	x	x	x
WIP-MDL-D1-ERM-05							x						x		x	x			x			
WIP-MDL-D1-PD-05		x	x	x			x						x		x						x	
WIP-MDL-D1-LOD-05	x	x				x	x	x	x							x	x		x	x	x	x
WIP-MDL-D1-FL-05									x	x								x				x
WIP-MDL-D1-WPM-05		x					x								x				x			

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-OAMOP-05		x	x		x								x						x			
WIP-MDL-D1-LI-05	x	x											x						x			
WIP-MDL-D1-MMT-05			x	x								x	x	x						x		
WIP-MDL-D1-RADP-05	x												x									
WIP-MDL-D1-TI-05	x	x											x						x			
WIP-MDL-D1-LM-06		x	x				x	x					x	x							x	
WIP-MDL-D1-FL-06									x	x								x				x
WIP-MDL-D1-RPT-06		x			x	x				x	x			x					x	x		
WIP-MDL-D1-DAMS-06			x															x		x		
WIP-MDL-D1-TEOTO-06		x	x				x	x					x	x							x	
WIP-MDL-D1-IACT-06	x	x				x	x						x	x		x			x	x	x	
WIP-MDL-D1-LPM-06					x	x	x	x	x				x			x				x	x	
WIP-MDL-D1-SOMP-06				x													x			x		
WIP-MDL-D1-OR-06	x		x										x	x						x		

*SEU / **NrP	K_W01	K_W02	K_W03	K_W04	K_W05	K_W06	K_W07	K_W08	K_W09	K_U01	K_U02	K_U03	K_U04	K_U05	K_U06	K_U07	K_U08	K_U09	K_K01	K_K02	K_K03	K_K04
WIP-MDL-D1-QMIM-06	x		x										x	x						x		
WIP-MDL-D1-KM-06							x									x				x		
WIP-MDL-D1-ICM-06							x									x				x		
WIP-MDL-D1-PFTT-07													x					x		x		
WIP-MDL-D1-DS-07	x	x	x	x	x	x	x	x	x			x	x	x			x	x	x	x		
WIP-MDL-D1-TPOP-07		x					x						x	x						x		
WIP-MDL-D1-MR-07	x		x					x				x						x	x			
WIP-MDL-D1-ACPD-07	x		x	x								x	x						x	x	x	
WIP-MDL-D1-IL-07		x				x								x		x		x		x	x	
WIP-MDL-D1-DOM-07	x			x								x	x									
WIP-MDL-D1-LISIM-07		x				x	x						x	x		x				x		
WIP-MDL-D1-COTAW-07	x	x			x	x	x						x	x		x			x	x		
WIP-MDL-D1-EE-07	x					x	x	x					x			x			x	x	x	x
WIP-MDL-D1-COEAC-07							x				x		x						x	x	x	

*SEU - Code of the learning outcome, **NrP - Subject identification number.

8. Graduation requirements.

The prerequisites for graduation and the award of the Diploma in Materials design and logistics are:

1) achievement of the learning outcomes specified in the curriculum,
2) passing the diploma examination,
3) a positive assessment of the diploma thesis.

In accordance with the ECTS system, the student of the Materials design and logistics degree programme must collect the number of points required by the curriculum - the total number of ECTS points. A total of 210 points (including 4 points for work placement) are required to complete the first-cycle degree programme. These points indicate the achievement of all the learning outcomes set for the field of study and the final grade for each subject listed in the schedule of curriculum implementation. The number of points awarded for a given subject reflects the student's workload, which includes the time required to master the knowledge, skills and competences defined as learning outcomes for the curriculum. Moreover, ECTS points include contact hours with the instructor and hours of student’s unassisted work necessary to prepare for examinations, tests, reports, presentations, etc.

Students of the first-cycle Materials design and logistics degree programme are required to write a diploma thesis. The topic of the diploma thesis is chosen by the student from a list of proposed topics. The student has the right to suggest their own thesis topic concerning their field of study, taking into account their research and professional interests. Each thesis topic is approved by the Faculty of Production Engineering and Materials Technology Curriculum Council. The diploma thesis is written under the guidance of a supervisor who is a research and teaching or teaching employee of the Faculty, with whom the student agrees the purpose and scope of the thesis and the manner of its completion. The diploma thesis is written during the last two semesters of study.

Students are obliged to submit the diploma thesis in accordance with the Study Regulations and deliver it in writing together with a digital record. The thesis is assessed by a supervisor and a reviewer. The diploma thesis must be positively reviewed in order to be given a further course of action. For the completion of the diploma thesis, the student is awarded 10 ECTS points, which are included in the total number of points required to complete the first-cycle degree programme.

The final condition for graduation from the first-cycle Materials design and logistics degree programme is passing the engineering diploma examination on the knowledge acquired in the field of study and the viva voce examination.

A prerequisite for taking the viva is obtaining at least a pass grade in the diploma engineering examination. A student may take the aforementioned examination only after obtaining the required number of 210 ECTS points, including 4 points for work placement, which ensures the achievement of the learning outcomes required for the field of study.

If a student fails to submit the diploma thesis by the given deadline (in accordance with the Study Regulations), he/she is removed from the student roster.

9. Courses or groups of courses, regardless of the form in which they are taught, along with the assignment of learning outcomes to them and the curricular content ensuring the achievement of these outcomes, as well as the methods of verification and assessment of the learning outcomes achieved by the student during the entire educational cycle.

Year of study: the first Semester: the first

WIP-MDL-D1-TSAHE-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Training on safe and hygienic education conditions	4								4	0	K_W08 K_K01	Materials engineering
Course content	Basic concepts in the field of health and safety. Legal regulations in the field of occupational health and safety and fire protection: the rules of moving and staying on the premises of the University. Health and safety rules related to the operation of technical devices and machines, the specificity of working at a computer. Accident hazards and health hazards at the University. Dangerous, harmful and burdensome factors. Order and cleanliness in the place of study. Preventive medical care. First aid in the event of an accident. The most common injuries and what to do in the event of their occurrence. Securing the scene of the accident. Fire protection. The causes of fires. Basic principles of fire protection. Rules for dealing with waste at the University - municipal and hazardous waste.											
Ways of assessment	final test											

WIP-MDL-D1-SL-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Supply logistics	15	15							30	2	K_W02 K_W05 K_W06 K_U01 K_U02 K_U05 K_K01 K_K02	Management and quality sciences
Course content	Logistic systems in the economy and in the enterprise. Supply functions. Supply logistics as an element of the company's logistics system and the supply chain. The need and methods of material needs planning. Choosing your sources of supply. Choosing a supplier and the form of cooperation with suppliers. Components of supply costs. Tasks and types of warehouses. Storage systems and technology. Planning and optimization of material flows in the warehouse. Warehouse transport systems and techniques (automatic identification, storage and transport devices). Planning of production processes. Control of production and flow of materials and finished products, goals and methods. IT technologies in supply logistics GS1, MRP, ERP, EDI. Integration of supply and production logistics. Inventories and their categories in manufacturing, trading and distribution enterprises. Determination of consumption norms. Inventory stocks. Determining the size of the delivery, taking into account the time of transport and inventory in transport. Inventory control methods: fixed point of order, periodic											

	inspection method. Determining the optimal size of the purchase batch using the EOQ method. Inventory classification using ABC and XYZ techniques. Preparation of specifications for a simple industrial product. Determining the demand for raw materials and materials on the basis of product specifications and production plan. Planning the flow of materials and goods.												
Ways of assessment	Lecture test, exercise test.												
WIP-MDL-D1-OHAS-01	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**	
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others					
Occupational health and safety	15								15	1	K_W08 K_K01	Materials engineering	
Course content	Basic issues related to OHS, legal aspects of OHS in national and international regulations. Hazards in the workplace - harmful, nuisance and hazardous factors. Consequences of non-compliance with health and safety regulations - accidents at work and occupational diseases. Means of collective and individual protection. Particularly hazardous work. Storage and transport of hazardous substances and materials. Occupational risk assessment. Prophylaxis of occupational health protection - training, health examinations. Basic information on: emergency first-aid procedures, evacuation, fire protection.												
Ways of assessment	Test.												

WIP-MDL-D1-BOCS-01	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Basics of computer science	15		15						30	2	K_W01 K_U04	Materials engineering
Course content	Introduction - basic concepts related to computer science, history of computer science. Computer structure. Operating systems. Computer networks. Office packages - overview and characteristics of basic functions. Introduction to computer graphics - raster graphics, vector graphics, applications. Databases - characteristics of basic types of databases. Introduction to high-level language programming, C ++ source code, compilers. Constants, variables, data types in C language, instructions that control program execution in C ++. Complex variables, user functions. Selected search and sorting algorithms, selected numerical algorithms. Introduction basic concepts related to computer work, computer structure, directory structure, computer networks. Office packages - overview and characteristics of basic functions, working with spreadsheets. Introduction to computer graphics, raster graphics and vector practical application. Databases - practical application examples. Principles of creating structural programs - examples.											
Ways of assessment	Test.											

WIP-MDL-D1-BOOAM-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Basis of organization and management	15	15							30	2	K_W07 K_W08 K_U07	Management and quality sciences
Course content	Organization, the essence of management, resources. Global, environmental, ethical and social management context. Managing the goals of the organization and planning. Strategic management. Making managerial decisions. Elements of the organizational structure. Organization design management. Managing organizational changes. Managing human resources. Managing interpersonal and group processes. Managing communication in organizations. Controlling process. Performance, quality and operational management. Technology and innovation management. Information systems management. Evolution of management practice and theory. Selected methods of enterprise management. Planning (essence, dimensions of the planning process, stages, types of plans). Management tools for planning and decision making. Techniques for improving the organization. Motivation (theories, motivators). Leadership and leadership. Control in the enterprise. Budget and business control tools. Logistics as an instrument of company management. Managing Cultural Diversity. Creativity and innovation. Creation of new businesses.											
Ways of assessment	Test.											

WIP-MDL-D1-MAT-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Mathematics	15	15							30	2	K_W01 K_U01 K_K02	Materials engineering
Course content	Functions of a single variable - domain, graphs, properties. Number sequences - basic definitions and theorems, limits of sequences. Functions of one variable - limits, continuity, kinds of discontinuity. Differential calculus for functions of a single variable - derivatives, its interpretation and applications, asymptotes, monotonicity of function, local extreme points, convexity and concavity, points of inflection. Indefinite integral - definition of the antiderivatives and indefinite integral, table of basic integrals, substitution rule for indefinite integrals, integration by parts, integration of selected types of rational, irrational, and trigonometric functions. Definite integral - definition of the Riemann integral, basic properties of the definite integral, substitution rule and integration by part formulas for the definite integrals, geometrical application of the definite integrals. Determining the domain of a function, study of the properties of functions. Testing monotonicity of sequences, determining the limits of number sequences. Computing limits, testing the continuity of a function, determining the kind of discontinuity. Finding the derivatives of the function, computing limits using the L'Hospital rule, determining the asymptotes, local extreme points, points of inflection, testing monotonicity, convexity and concavity of the function. Computing indefinite integral. Computing definite integral. Applications of definite integrals.											
Ways of assessment	Quizzes (during tutorials), achievement test, passing the lecture (test).											

WIP-MDL-D1-IPP-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Intellectual property protection	15								15	1	K_W08 K_W09 K_U06 K_U08 K_K01	Materials engineering
Course content	Information on the protection of intellectual property - philosophical and economic aspects. Patent information - preparation for filing an invention, testing patentability, using patent databases to analyze own research topics. Professional secrecy and personal data protection. National, European and international procedure for granting patents. Types and general characteristics of related rights. Copyrights on the Internet. Copyright restrictions Piracy, plagiarism and receiving stolen goods. Selected penal provisions. Creation and expiry of copyright, public domain. Protection of scientific works. Organizations of collective copyright management. Employee and scientific works. Graduate rights. Analysis of selected patents.											
Ways of assessment	Test, colloquium.											

WIP-MDL-D1-EB-01	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Economy basics	15	30							45	5	K_W01 K_W07 K_W08 K_U07 K_U08 K_K03	Management and quality sciences
Course content	Basics of economics, basic goals and economic categories. Basic problems of economic choice. Basic entities in a market economy. The state as an entity regulating the economy. The role of the state in a market economy. State budget and fiscal policy. Money, money market. Monetary policy of the state. Inflation and unemployment. Economic growth. Measures of economic growth and development. Participants in the management process and connections between them. The theory of rational consumer behavior. The theory of enterprise functioning. Practical methods of enterprise activity assessment. International exchange. Globalization. Fundamentals of the theory of consumer choice. Production and costs in the enterprise. Product and national income. National income determinants. Business cycle. Unemployment. Inflation. Elements of trade policy. The IS - LM model.											
Ways of assessment	Written exam, colloquium.											

WIP-MDL-D1-MCH-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Materials chemistry	30	15	15						60	5	K_W01 K_W03 K_W04 K_U03 K_U04 K_U09 K_K01 K_K02	Materials engineering
Course content	Structure of the atom. Periodic table of elements. Chemistry as a source of modern materials. Chemical bonds and intermolecular interactions and their influence on the physico-chemical properties of materials. States of matter. Molecular and ionic chemical reactions as methods of obtaining materials. Chemical kinetics and statics. Catalysis and catalysts. Equilibria in electrolyte solutions. Redox reactions. Electrochemistry. Electrochemical energy sources. Corrosion protection of metallic materials. Metals and alloys. Properties and methods of obtaining selected metals (iron, copper, zinc, aluminium) from primary and secondary materials. Lanthanides - properties and applications in modern magnetic and optoelectronic materials. Non-metals. Chemistry of carbon compounds. Natural and synthetic polymers. Silicon. Semiconductors. Silicate polymers. Sol-gel derived materials. Nomenclature, sum and structural formulae of inorganic compounds. Valency and degree of oxidation of elements. Molecular and ionic reaction equations. Redox reactions. Stoichiometric calculations. Molar and											

	percentage concentration. State of equilibrium in a chemical reaction. The rule of contrariety. Dissociation of strong and weak electrolytes in aqueous solutions, pH. Electrochemical cells. Electrolytic preparation of materials. Faraday's laws of electrolysis. Health and safety training. Regulations of the chemistry laboratory. Technique of basic laboratory operations. Methods of obtaining and properties of selected inorganic compounds Ionic reactions. Dissociation and pH in solutions of weak and strong electrolytes. Redox reactions. Basics of electrochemistry and corrosion of metallic materials. Identification of selected plastics.
Ways of assessment	Assessment of student activity during classes and laboratory exercises. Final tests.

WIP-MDL-D1-TIOTC-01	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
The impact of the company on the environment	15	30							45	4	K_W01 K_W03 K_W08 K_U01 K_U03 K_U06 K_K01 K_K02	Materials engineering

Course content	Introduction to the subject: Basic definitions, concepts and units. Types of pollution and sources of their formation. Fuel combustion processes as the main source of pollutant emissions to the natural environment. The impact of solid and liquid fuel combustion on the natural environment. The impact of combustion of gaseous

	fuels on the natural environment. The impact of thermal waste treatment on the environment. The mechanism of formation of selected gaseous pollutants. The mechanism of dust pollution formation. Pollution reduction methods. Calculation of the chemical composition of exhaust gases for gaseous fuels. Calculation of exhaust gas chemical composition for solid and liquid fuels. Calculation of the emissions and emission factors of gaseous pollutants.												
Ways of assessment	Test, final test.												
WIP-MDL-D1-SD-01	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**	
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others					
Sustainable development	15	30							45	4	K_W01 K_W06 K_W07 K_W08 K_U04 K_U06 K_U08 K_K01 K_K02 K_K03	Materials engineering	
Course content	Introduction to the issues of sustainable development. Sustainability initiatives. Sustainable development in legal documents. Sustainability indicators. Tools for implementing sustainable development. Ecological, social and												

	economic aspects of sustainable development. Assessment of sustainable development activities in Poland and in the European Union countries. Case study of sustainable activity of selected economic entities using SWOT analysis - environmental, economic and ecological aspects.											
Ways of assessment	Test, final test.											
WIP-MDL-D1-MS-01	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Materials science	30	15	30						75	6	K_W01 K_W03 K_U04 K_U05 K_K02 K_K03	Materials engineering
Course content	Introduction to materials science - meaning and development trends. Basic groups of materials. Structure and strengthening of metals and alloys. Shaping the structure and properties of materials. Metals and their alloys. Non-metallic materials. Functional and special materials. Analysis of phase equilibrium systems, lever rule, Gibbs phase rule. Determining the grain size. Linear method of analyzing the share of structural components. Point method for the analysis of the share of structural components. Calculation of mechanical properties. Thermal analysis. Crush and recrystallization. Macroscopic research. Microscopic research. Surface stereometry studies. X-ray examinations. Mechanical research.											
Ways of assessment	Test, report, written exam.											

WIP-MDL-D1-EM-01	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Engineering materials	30	15	30						75	6	K_W01 K_W03 K_U04 K_U05 K_K02 K_K03	Materials engineering
Course content	Review of engineering materials. The importance of engineering materials. Metals and their alloys - mechanisms of crystallization, plastic deformation and recrystallization of metals, heat treatment, structure, properties, use of metallic materials. Ceramic materials - classification, manufacturing technologies, structure characteristics, properties and application. Polymer materials - classification and nomenclature of polymers, polymerization, modification, production of polymers, structure characteristics, properties and application. Composite materials - components, characteristics and methods of their production, principles of strengthening composites depending on the geometry of the strengthening phase and the type of components, composite technologies, structure, properties and application of composite materials. Working conditions of engineering materials. Consumption of engineering materials. Stereology of engineering materials - calculations. Properties of engineering materials - calculations. Structure and properties of metallic engineering materials. Structure and properties of ceramic engineering materials. Structure and properties of polymer engineering materials. Structure and properties of composite engineering materials.											

Ways of assessment	Report, test, written exam.

Year of study: the first Semester: the first

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 379**

Year of study: the first **Semester**: the second

WIP-MDL-D1-QM-02	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Quality management	15	15							30	2	K_W07 K_U04	Management and quality sciences
Course content	Basic concepts and definitions in the field of quality management. Theoretical foundations of quality management. Motivating employees to raise the level of quality. Quality management concepts. TQM (Total Quality Management) - management philosophy. Quality assurance in pre-production, production and post-production. Quality management systems. Integration of management systems. Quality management in various sectors. Quality management methods. Quality management tools and techniques. Statistical quality control. Methods of testing the quality of services. FMEA - Failure Mode and Criticality Analysis. Pareto - Lorenz analysis. Analysis ABCD - Suzuki method. Analysis 5M. Ishikawa diagram. Shewhard's control cards. Qualitative ability of the process, machines.											
Ways of assessment	Test.											

WIP-MDL-D1-TBOCD-02	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
The basics of CAD design				30					30	2	K_W03 K_U04 K_K02	Materials engineering
Course content	Methods of volumetric and surface shaping. Finishing elements, parametric equations - variant designs. Assembly modeling - list of machine parts, types of connections. Drawing multi-element assemblies (assembly drawing) as a project using available database and design tools. Designing sheet metal parts and welded parts. The use of Inventor to design production tools. Load analysis of metal structures depending on the materials used. Development of a project of a selected complex device, along with the selection of materials for production, strength analysis and technical documentation - hybrid work completed with a presentation of the project.											
Ways of assessment	Assessment of work in the classroom, assessment of project work.											

WIP-MDL-D1-BOCS-02	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Basics of commodity science	15	15							30	3	K_W01 K_W04 K_U04 K_U08 K_K01	Materials engineering
Course content	Commodity science as a scientific discipline. Goods and their classification. Goods classification systems. Standardization and its importance in the goods market. Commodity science of industrial articles. Commodity science of food products. Packaging in logistic systems. Automatic identification of goods. Factors influencing the quality of products. Methods of product quality assessment. Food safety systems (GMP/GHP, ISO 22000, HACCP). The essence and scope of goods standardization, basic documentation. Products in the transport process. Characteristics of selected product groups. Technologies for the production of metallic, ceramic and polymer products. Structural research methods for industrial products. Methods of testing the mechanical properties of industrial products.											
Ways of assessment	Test, colloquium.											

WIP-MDL-D1-PE-02	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Physical education I		30							30	0	K_U02 K_K01	Materials engineering
Course content	**Classes** (team games) **Volleyball** Volleyball warm-up, high and low posture. Improving the ways of moving around the pitch. Improving the bounce of the ball with both hands, up and down. Improving the tennis, gliding game. Improving the reception of the serve in the lower and upper way to zone 0. Improving attack from zones: 2,3,4. Improving Pledge (Block): Single. A simplified game, a school game, a proper game. **Basketball** Diagnostics of the technical skills of the game. Teaching ways to move around the pitch, moving with the ball in the goat, trying to play games 1x1. Teaching/improving dribbling: isolation, walking, jogging, running. 1x1 game. Teaching/improving passes and throws. Passing in place on the move. A throw from the place, after the kid, after passing the partner. Two-track throw. Trials of 2x2 games. Improving basic technical skills learned in class. 3x3 tournament - streetball: rules, regulations, game system. **Football** Diagnostics of technical skills. Improving ball handling with a change of direction and pace. School game. Improving ball hitting with foot and head. School game. Improving ball receptions. School game. Improving shots on goal. The game proper. Indoor football tournament - 5 - person teams.											

	EXERCISES (individual sports) **Functional training** Theory: An Introduction to TF. Practice: FMS functional assessment - selected tests. Re-education of erroneous movement patterns. Prehab - an exercise focused on injury prevention. Preparation for movement, prehab, shaping central stability. Preparation for movement, prehab, core, shaping cardiovascular and respiratory endurance, regeneration - fascial techniques. Preparation for movement, core, shaping cardiovascular and respiratory endurance, regeneration - comprehensive stretching. Preparation for movement, core, flexibility - plajometrics, cardiovascular and respiratory endurance, regeneration - fascial techniques. **Health training** Theoretical and practical classes: introduction to TZ, preparation for movement, TA Schultz's concept - heaviness, warmth. Shaping the proper mobility in the joints (mobility), introducing rollers to relax the muscles before stretching. TA - introduction of the full range of training - learning to listen to your own body. Shaping mobility, introducing stabilization exercises (board), in various starting positions. Developing exercises on rollers - introducing rubbing to increase the effect of relaxation. Comprehensive stretching - aimed at stretching (within the individual limits of the muscles). TA - full range of training. Preparation for movement, strengthening of postural muscles, comprehensive rolling, fascial stretching. TA- full range of training. **Fitness/pilates** Basic exercises to strengthen the "hoop of strength", that is the abdominal muscles, buttocks and the broadest muscles of the back. Introduction to exercises in the Pilates technique. Exercises for the lats and torso muscles - the technique of performing these exercises and learning how to breathe properly. Stretching and relaxing exercises. Arms and Upper Body - Strengthening and stretching and the ability to relax your upper body. Pilates exercises - entering the first level - exercises to strengthen the back and abdominal muscles. Strengthening the "central rim" through precise selection of exercises continuation of the first level. Strengthening and stretching the legs - from buttocks to feet. Control over the care of maintaining the proper body system - level one. Strengthening arm exercises. Relaxation of all the muscles of the "middle girdle" - level one. Introducing Pilates

	exercises to the second level by developing exercises from the first level. Relaxing your upper body and stretching at the same time with a fit ball. Running the sacral area - second level. Strengthening the "middle rim" and legs with weights - second level. Strengthening arms and back with utensils - sticks, weights. Level Three Pilates - continuing to strengthen the muscles, especially the "middle girdle". Coordination of movements in more complex exercises. Applying advanced exercises to the abdominal and leg muscles coming from level three. **Table Tennis** Diagnostics of the technical skills of the game. Starting position and basic rules of moving around the table. Singles game. Diagonal stroke versus forehand, singles gametime for points. Strokes versus forehand and backhand diagonally, plays for points with alternating exercisers at the tables. Improving known strokes, straight strokes, emphasis on the work of the legs at the table. Game for points with a change of practitioners. Individual tournament - everyone's game. **Swimming** (activities only if the facility is rented) Occupational health and safety training, familiarization with the swimming pool regulations, study regulations, organization during classes - course of classes. Getting accustomed to the water environment, spreading backstroke, crawl on the chest, classic, 25m each. Assessment of the group's swimming technique. Exhausts to the water at the wall, 5 exhalations. Teaching backstroke (correct technique). Teaching breast crawl style (correct technique). Teaching classical style (correct technique). Improving swimming techniques in the following styles: back, chest crawl, classic. **Gym** (classes only if the facility is rented) Acquainting students with the facility, the introductory part is carried out in the fitness room. Overview of the functioning of the gym equipment. Anatomical muscle adaptation. Preparation for exercise - fitness room: raising the body temperature, dynamic stretching, mobilization exercises preparing for strength training. Moving to the gym: strength training - the FBW principle (full body workout), oxygen training - based on cross trainers, treadmills, bikes, steppers - continuous efforts with an intensity of about 60% HRmax. Muscular endurance.

	Preparation for movement - fitness room: steps, dynamic stretching, strengthening exercises with the use of dumbbells and fit ball, exercises for central stabilization. Moving to the gym: strength training - muscle endurance of large muscle groups, the number of repetitions from 12 to 16 in a series, oxygen training - based on cross trainers, treadmills, bikes, steppers - mixed efforts similar to interval exercises, heart rate depending on individual exercise capacity. Training based on the training programs of the tutor or attempts to introduce individual training programs that must be approved by the tutor. Preparation for movement - fitness room: steps, dynamic stretching, strengthening exercises using the weight of your body, exercises for central stabilization. Transition to the gym - strength training, oxygen training - attempts to introduce hybrid training 5 min cross trainers/training circuit for large muscle groups 4 exercises. **Tennis/Beach Tennis** Teaching forehand, tennis games and activities. Teaching ambidextrous backhand strokes, tennis games and fun. Teaching flat service, school game - doubles. Teaching the base position in beach tennis, ways of moving around the court. Teaching bounce, forehand/backhand, moving around the net. Doubles tournament - tennis. Doubles tournament - beach tennis.
Ways of assessment	Credit (oral - knowledge of the theoretical foundations of the selected discipline, practical - implementation of motor tasks during individual classes, other - assessment of cooperation in a group, social component).

WIP-MDL-D1-MAT-02	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Mathematics	15	15							30	3	K_W01 K_U01	Materials engineering

											K_K02	
Course content	The set of complex number - basic definitions, theorems, properties, elementary operations, algebraic and trigonometric form of complex number. Matrices and determinants - basic definitions, properties, theorems, basic operations with matrices, inverse matrices, the matrix - vector equation. The systems of linear equations - basic definitions, the Cramer rule, the Gaussian elimination. Analytic geometry in space - scalar product, cross product, scalar triple product and its geometrical interpretation. Line and plane in space. Function of two variables - definition, domain, partial derivatives, minima and maxima for function of two variables, total differential. Integral calculus for the function of two variables, the *y* - and *x* - simple regions, polar coordinates, change of variables, applications in geometry. Ordinary differential equations - the selected types of ordinary differential equations. Elementary operations of complex numbers in algebraic and trigonometric form. Solving equations in the complex domain. Operations with matrices, calculating determinants of any degree, inverse matrices, solving matrix equations. Solving systems of linear equations using the Cramer rule and Gaussian elimination. Calculating scalar product, cross product, scalar triple product and their geometrical application. Determining the equations of a line and a plane in space. Determining the domain of the function of two variables. Computing the partial derivatives, determining the minima and maxima for the function of two variables. Computing the double integral over the *y* - and *x* - simple regions, application of polar coordinates, applications in geometry. Solving the selected types of ordinary differential equations.											
Ways of assessment	Quizzes (during tutorials), final test, exam.											

WIP-MDL-D1-SCAN-02	Form of classes – number of hours								Total number of hours:	Total number of ECTS points	Outcomes defined for whole Program	Discipline(s) to which the course relates
	Lecture- **15**	Classes **15**	Laboratory	Project	Field activities	Seminar	Internship	Others				
Social communication and negotiations	15	15							30	2	K_W07 K_U07 K_K03	Management and quality sciences
Course content	Social communication. Means and forms of communication. Models of the communication process. Obstacles to effective communication. Principles and types of negotiations. Negotiation stages. Breaking down barriers to negotiations. Intercultural negotiations. Verbal communication, non-verbal communication. Psychological aspects of communication. Counter - argumentation methods. Body language. Public speaking. Attitudes in negotiations. The Harvard model of negotiation. Negotiation tactics.											
Ways of assessment	Test/colloquium.											

WIP-MDL-D1-MFTEI-02	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				

Materials for the electronics industry	15		15						30	2	K_W01 K_W03 K_W04 K_U03 K_U09 K_K01 K_K02	Materials engineering
Course content	Introduction to electronic materials science: structure of matter, typical processing and manufacturing of electronic components, properties of materials and methods of their testing. Conductive materials: electric conductivity of metals, wire materials, resistive materials, contact materials, special conductive materials**.** Cryoresistivity, superconductivity and superconducting materials. Semiconductor materials: properties and application of semiconductors. Manufacture of semiconductor materials. Dielectric materials: structure and properties of dielectrics, types and applications of dielectrics. Liquid crystal materials: structure, properties and applications. Determination of the characteristics and static parameters of the transistor. Marking of the Fe-Mo thermocouple and determining the point of inversion. Examination of the LED diode's and the laser diode's characteristics. Measurement of the width of the energy gap in semiconductors. Characteristics of resistances. Testing the electrical strength of materials, breakdown voltage measurement.											
Ways of assessment	Reports from laboratory exercises, test/colloquium.											

WIP-MDL-D1-EP-02	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				

Engineering physics	30	15	15						60	5	K_W01 K_W03 K_U03	Materials engineering
Course content	Scalars and vectors. Mechanics of point mass and rigid body. Oscillatory motion and waves. Fluid statics and dynamics. Temperature, kinetic theory, and the gas laws. Thermodynamics. Electric charge electric field, electric potential. Electric current, resistance, and Ohm's Law. Electric circuits. Magnetic field and AC Circuits. Electromagnetic waves. Geometric optics. Basics of modern physics. Elements of nuclear physics. Mechanics, molecular and heat physics, optics and electricity laboratories.											
Ways of assessment	Reports from laboratory, colloquium, exam.											
WIP-MDL-D1-PL-02	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Production logistics	15	6		9					30	3	K_W02 K_W05 K_U04 K_K02	Management and quality sciences
Course content	General theory of logistics, production logistics subsystem and the logistics system in a production enterprise. Subject, scope and features of production logistics. Work in progress inventory. Design of the logistics network, integrated systems supporting production - OPT, MRP, MRP II. Integrated systems supporting production - ERP, CIM, JiT. Lean Manufacturing as a modern technique in logistics management. Planning of material requirements, principles of controlling the flow of materials and raw materials. Logistics production infrastructure											

	- requirements, means of internal transport, designing of transport routes, storage. Types and forms of production and their impact on the production logistics system. Repetition of basic knowledge about logistics systems with particular emphasis on production logistics. Discussion of production and inventory planning issues, exercises and tasks. Scheduling of working time and usage of internal transport equipment in production departments, exercises and tasks. Economical production batch size, exercises and tasks. Designing workstations and material flow in production departments. Designing of transport tasks in production departments.
Ways of assessment	Test, colloquium, project.

WIP-MDL-D1-MMAT-02	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Modern materials and technologies	15		15						30	3	K_W03 K_W04 K_U03 K_K02	Material engineering
Course content	Basic criteria for the classification of composites. Characteristics of modern composite reinforcing fibers. Technologies for the production of modern composites. Powder metallurgy technology. Modern coating technologies. Modern carbon materials, including fullerenes, nanotubes and graphene. Shape memory materials. Metallic glass, technologies for the production of amorphous materials, properties and application of metallic glasses. Nanomaterials, nanotechnologies - properties and selected manufacturing technologies. Superconductor, the phenomenon of superconductivity, properties and application of superconductors. Fibrous											

	materials: glass, carbon, Kevlar and vectran fibers: microstructural studies and selected properties. Fiber - reinforced composite materials - contact method for the production of composites, microstructural tests and selected properties. Composite materials reinforced with particles - determination of volume and weight fractions of the reinforcing phase. Materials produced by powder metallurgy methods - microstructural and mechanical tests of tool steels obtained by the traditional method and the powder metallurgy method. Shape memory materials - determination of the temperature characteristic for two-way transformation in the nitinol alloy. TBC (thermal barrier coatings) - microstructural studies. Metallic glasses - microstructural and x-ray structure tests.
Ways of assessment	Written test.

WIP-MDL-D1-NGM-02	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
New generation materials	15		15						30	3	K_W01 K_W03 K_W04 K_U03 K_U04 K_U05 K_K01 K_K02 K_K04	Materials engineering

Course content	Classification and nomenclature of engineering materials, bonds between atoms. General characteristics of basic groups of engineering materials. Structure of materials: crystalline, amorphous. Phase equilibrium systems. Selection of engineering materials in modern engineering. New generation metallic materials, shape memory alloys. Ceramic, vitreous and glass-crystalline materials (new generation glasses). Modern polymeric and composite materials. Characterization of nanomaterials. New generation of biomaterials. Test methods for new generation materials. Physical properties of selected new generation materials. Modern ceramic materials - manufacture and determination of basic properties. Fibre - reinforced composites and not only... - tipping, testing of selected properties of the obtained materials. Fibrous materials of the new generation - studies of selected properties. Glass and glass-ceramic materials as new generation materials - fabrication and determination of selected properties. Metallic materials of the new generation - microstructural studies. Surface modification - microstructural studies and selected properties.												
Ways of assessment	Report on selected exercises, colloquium.												
WIP-MDL-D1-MOMI-02	**Form of classes – number of hours**								**Total number of hours**	**Totalnumber of ECTSpoints**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Methods of materials investigation	15		30						45	5	K_W01 K_W03 K_W04 K_U08 K_U09 K_K01	Materials engineering

Course content	Introduction: materials, their structure and materials testing methods. Structural investigation of materials. Quantitative description of the structure of materials. Methods of testing the properties of materials. Non-destructive testing of materials. Research on the structure of materials. Research on the properties of materials.											
Ways of assessment	Report on selected exercises, test, written exam.											
WIP-MDL-D1-IOR-02	**Form of classes – number of hours**								**Total number of hours**	**Totalnumber of ECTSpoints**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Instrumentation of research	15		30						45	5	K_W01 K_W03 K_W04 K_U08 K_K01	Materials engineering
Course content	Outline in the development of materials and trends in the development of methods of their study. Apparatus used for macroscopic and microscopic examination of materials (construction and types of microscopes). Research instruments for determining the mechanical properties of materials (construction and use of a universal testing machine, construction and types of hardness testing devices). Apparatus used in non-destructive testing of materials. Macroscopic research. The use of microscopes in the assessment of the structure of materials. The use of a universal testing machine and hardness testers in the assessment of material properties. Construction and use of an X-ray diffractometer as an example of non-destructive testing. Chemical composition analyzers.											
Ways of assessment	Test, written exam.											

Year of study: the first **Semester**: the second

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Year of study: the second **Semester**: the third

WIP-MDL-D1-PE-03	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Physical education II		30							30	0	K_U02 K_K01	Materials engineering
Course content	**EXERCISES** (team games) **Volleyball** Diagnostics of technical skills - selected tests. Improving the ways of moving around the volleyball court in a deficit of time with an additional task. The game proper. Improving the bouncing of the ball in a high posture after moving along the net. The game proper. Improving bouncing with both hands upwards at different distances, emphasizing a clean bounce, the ball without rotation. The game proper. Improving the rotational play, in zone 1/5 on 8,9 meters of the field. The game proper. Improving the adoption of the spinning serve to the zero point, tangent zones 2/3. The game proper. Learning/improving the soaring service - fleets. The target serves between the top band and the edges of the antenna, the ball passes in a space of 80 cm. The game proper. Improving ball bounces in a low stance with an unbalanced balance, volleyball pad, volleyball throw. The game proper. Learning/improving ball bounces in the form of an exhibition, to wings 2/4 and to zone 3 "short". The game proper. Improving dynamic capture, directional attack. Aim the corners of the field, or 8,9 meters of the opponent's court. The game proper. Improving the pledge. Double block, aimed at creating a "block seam" - elimination of the so-called "Holes in the block". From the place, from the access from the step-											

	away step, from your zone. The game proper. Proper game with the use of all the elements learned during the classes. **Basketball** Tests: slalom dribble, personal throws. Improving dribbling during small school games with additional tasks. Teaching/improving plays, pick and roll. A 3x3 game with curtains. Teaching/improving the correct defensive posture in zone defense 2:3. Simplified game. Teaching/improving positional attack in zone defense 2:3. The game proper. **Football** Diagnostics of technical skills. Improving ball handling with a change of direction and pace. The game proper. Improving hitting the ball with the leg and head after leading, after being fed from the air. The game proper. Improving ball receptions with the opponent's assist. The game proper. Improving shots on goal in match situations. The game proper. Indoor football tournament - 5-person teams. **EXERCISES** (individual sports) **Functional training** Prehab, exercise overview, training circuit. Strengthening weak links - circuit training based on advanced functional exercises. Strengthening the core - iliopsoil-lumbar complex, dynamic exercises. Shaping cardiovascular and respiratory endurance, advanced stretching exercises combined with the control of the respiratory rhythm. Comprehensive functional training: preparation for movement, core strengthening, flexibility-power, regeneration - comprehensive stretching combined with an individual breathing rhythm. **Health training** Theoretical and practical classes: introduction to TZ, preparation for movement, TA Schultz's concept - heaviness, warmth. Shaping the proper mobility in the joints (mobility), introducing rollers to relax the muscles before stretching. TA - introduction of the full range of training - learning to listen to your own body. Shaping mobility, introducing stabilization exercises (board), in various starting positions. Developing exercises on rollers - introducing rubbing to increase the effect of relaxation. Comprehensive stretching - aimed at stretching (within

	the individual limits of the muscles). TA - full range of training. Preparation for movement, strengthening of postural muscles, comprehensive rolling, fascial stretching. TA - full range of training. **Fitness/pilates** Basic exercises to strengthen the "hoop of strength", that is the abdominal muscles, buttocks and the broadest muscles of the back. Introduction to exercises in the Pilates technique. Exercises for the lats and torso muscles - the technique of performing these exercises and learning how to breathe properly. Stretching and relaxing exercises. Arms and Upper Body - Strengthening and stretching and the ability to relax your upper body. Pilates exercises - entering the first level - exercises to strengthen the back and abdominal muscles. Strengthening the "central rim" through precise selection of exercises continuation of the first level. Strengthening and stretching the legs - from buttocks to feet. Control over the care of maintaining the proper body system - level one. Strengthening arm exercises. Relaxation of all the muscles of the "middle girdle" - level one. Introducing Pilates exercises to the second level by extending the exercises from the first level. Relaxing your upper body and stretching at the same time with a fit ball. Running the sacral area - second level. Strengthening the "middle rim" and legs with weights - second level. Strengthening arms and back with utensils - sticks, weights. Level Three Pilates - continuing to strengthen the muscles, especially the "middle girdle". Coordination of movements in more complex exercises. Applying advanced exercises to the abdominal and leg muscles coming from level three. **Table Tennis** Diagnostics of the technical skills of the game. Starting position and basic rules of moving around the table. Singles game. Diagonal stroke versus forehand, point singles. Strokes versus forehand and backhand diagonally, plays for points with alternating exercisers at the tables. Improving known strokes, straight strokes, emphasis on the work of the legs at the table. Game for points with a change of practitioners. Individual tournament - everyone's game. **Swimming** (activities only if the facility is rented) Occupational health and safety training, familiarization with the swimming pool regulations, study regulations,

	organization during classes - course of classes. Dissolve. Improving backstroke, long distance swimming. Perfect your chest crawl style, long distance swimming. Perfecting the classic style, swimming long distances. Improving swimming techniques in the following styles: back, chest crawl, classic. **Gym** (classes only if the facility is rented) Acquainting students with the facility, the introductory part is carried out in the fitness room. Overview of the functioning of the gym equipment. Anatomical muscle adaptation. Preparation for exercise - fitness room: raising the body temperature, dynamic stretching, mobilization exercises preparing for strength training. Moving to the gym: strength training - the FBW principle (full body workout), oxygen training - based on cross trainers, treadmills, bikes, steppers - continuous efforts with an intensity of about 60% HRmax. Muscular endurance. Preparation for movement - fitness room: steps, dynamic stretching, strengthening exercises with the use of dumbbells and fit ball, exercises for central stabilization. Moving to the gym: strength training - muscle endurance of large muscle groups, the number of repetitions from 12 to 16 in a series, oxygen training - based on cross trainers, treadmills, bikes, steppers - mixed efforts similar to interval exercises, heart rate depending on individual exercise capacity. Training based on the training programs of the tutor or attempts to introduce individual training programs that must be approved by the tutor. Preparation for movement - fitness room: steps, dynamic stretching, strengthening exercises using the weight of your body, exercises for central stabilization. Transition to the gym - strength training, oxygen training - attempts to introduce hybrid training 5 min cross trainers/training circuit for large muscle groups 4 exercises. **Tennis/Beach Tennis** Perfect forehand, backhand, singles school game. Singles tournament - tennis. Improving the ways of moving around the pitch during the game proper in beach tennis. Singles tournament - beach tennis.
Ways of assessment	Credit (oral - knowledge of the theoretical foundations of the selected discipline, practical - implementation of motor tasks during individual classes, other - assessment of cooperation in a group, social component).

WIP-MDL-D1-EL-03	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Ecologistics	15	15							30	3	K_W01 K_W02 K_W04 K_W06 K_W07 K_U04 K_U06 K_U07 K_K01 K_K02	Management and quality sciences
Course content	Placing the ecologistics concept in the theory and practice of applied logistics. Evolution, definitions and subject of the ecologistics concept. Comparison of ecologistics with related concepts and its relation to traditional logistics. Circulation of waste and secondary raw materials in the environmentalist cycle - loops and supply chains. Fundamentals of waste management in the concept of ecologistics. Implementation of ecologistic measures into business practice. Tasks and processes of ecologistics in waste management and their economic consequences. Legal and organisational determinants of waste management in Poland and EU countries. Analysis of the volume of generated industrial waste and the level of its management in Poland. Model concept of ecologistics processes implementation in waste streams management. Cost model of ecologistics processes											

	in waste streams management. Advantages analysis of ecologistics in waste streams management. Presentation of the assumptions of a descriptive model of the logistic process flow and a mathematical model of the logistic costs of industrial waste management in an industrial waste management company X. Creation of an Excel database, according to a descriptive model, which takes into account the types of industrial waste according to the Waste Catalogue, characterises the customers of company X, determines the unit component costs associated with the transport and storage of waste and the management of waste by landfilling or giving to recovery organisations. Calculation from a database of the logistic costs, according to a mathematical model, associated with waste transport, storage, and management by landfilling or recovering. Analysing the results obtained by means of graphical and tabular presentation of the various types of statements, comparisons, calculations, etc., concerning the current status. Creation of forecasts related to individual cost components, analysis of different variants of data changes, presentation of forecasts in graphical and tabular form. Creation of forecasts related to individual cost components, analysis of different variants of data changes, presentation of forecasts in graphical and tabular form. Creation of simulations related to individual cost components, analysis of different variants of changes in elements of both models, presentation of simulations in graphical and tabular form.
Ways of assessment	Task, credit colloquium.

WIP-MDL-D1-MM-03	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Metallic materials	30		30						60	6	K_W01 K_W04	Material engineering

											K_U03 K_K02	
Course content	What is metal? The main properties of metals. Characteristics of the metallic bond. Network structure of metals. The theory of the metallic state. The structure of metals. Characteristics of network defects. Polycrystalline structure of metals. Metal alloys - characteristics and classifications. Solid solutions and intermetallic phases - definitions and classifications. Crystallization of metals - the mechanism of crystallization. Ingot crystallization. Solidification of feet in conditions of imbalance. Allotropic changes. Plastic deformation and recrystallization of metals. Alloys phase equilibrium diagrams - preparation methodology, main rules, cooling curves. Characteristics of phase equilibrium diagrams. Characteristics of the Fe-Fe_3C diagram, characteristics of transformations and structural components, division of alloys according to the Fe-Fe_3C diagram and their characteristics. Steel: terminology, steel classifications. Alloying elements in steel. Characteristics and classification of aluminum alloys and copper alloys. Characteristics and classification of magnesium and titanium alloys. Crystallographic aspects of the metallic state, the crystallization process of a metallic material. Alloys phase equilibrium systems - preparation methodology - theoretical and practical aspects. Research on the physicochemical properties of iron alloys. Research on the physicochemical properties of copper alloys. Research on the physicochemical properties of aluminum alloys. Research on the mechanical properties of metallic materials. Microstructural studies of iron alloys. Microstructural studies of copper alloys. Microstructural studies of aluminum alloys. Microstructural studies of magnesium and titanium alloys.											
Ways of assessment	Written test, exam.											

WIP-MDL-D1-CM-03	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Ceramic materials	30		30						60	4	K_W01 K_W03 K_W04 K_U03 K_U04 K_U05 K_K01 K_K02 K_K04	Material engineering
Course content	General characteristics of the ceramic industry - historical development in Poland and the world. Ceramic materials - characteristics of structure and properties. Comparison with other engineering materials. Basic ceramic raw materials - criteria for classification and requirements that they must meet. Types of ceramic masses. Methods of preparation, enrichment and processing. Production of ceramic products - general scheme. Example technologies. Characteristics of selected groups of ceramic materials (refractory mats, building ceramics...). Glass - material of the ceramic industry. Raw materials of glassmaking. Properties and applications of glasses. Modern ceramic materials and technologies of their production. Health and safety training and discussion of the rules of the course credit. Macroscopic and microscopic analysis of basic ceramic raw materials. Design of ceramic masses. Manufacturing of ceramic masses. Forming of ceramic products. Drying											

	and firing of ceramic products. Glazing, decoration, processing of ceramic products. Testing of selected properties of ceramic materials. Technological processes of production of selected ceramic materials.											
Ways of assessment	Report on selected exercises, colloquium.											
WIP-MDL-D1-SM-03	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Strategic management	15	30							45	4	K_W07 K_U07 K_K02	Management and quality sciences
Course content	The essence of the company's strategy - main trends and schools of strategic management, vision, mission, goals and tasks of strategic management. Analysis of the competitive environment. Strategies of enterprise development - levels of strategic management, criteria and types of strategies, basic strategies of enterprise competing. Models of making a profit. The impact of globalization processes on strategic management of enterprises. Minimizing the risk of running a business as a result of the use of diversification and strategic alliances. Positioning of products on the market and strategic use of available resources. Analysis of the macro-environment. Sectoral analysis. Analysis of the company's potential. Analysis of the strategic position. Scoring the attractiveness of the sector. Analysis of the bargaining power of the enterprise and the impact of the intensity of competition and substitution threat on the company's ability to conduct business. Analysis of the state of the company's environment with the use of the scenario method. Assessment of the market position of strategic business units using portfolio methods. Analysis of the company's competition with the use of a map of strategic groups. Analysis of the company's competitive potential with the use of the analysis of key success factors.											

	Monitoring the company's strategy with the use of a strategic scorecard. Analysis of the company's strategic position using the SPACE method. Using the SWOT analysis to assess the level of strategic management in the company.											
Ways of assessment	Colloquium, exam.											
WIP-MDL-D1-DADM-03	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Databases and Data Mining			30						30	3	K_W03 K_U04 K_U05 K_K02	Materials engineering
Course content	Database systems. Object - oriented database model. Relational database model. Structured query language. SQL complex instructions. Database management system - MySQL. Macros - application generators for database. Introduction to Visual basic language.											
Ways of assessment	Test.											
WIP-MDL-D1-FL-03	**Class type – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for the whole programme**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field class	Seminar	Internship	Others				

Foreign language (English)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Methods of assessment of learning outcomes	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation.											
WIP-MDL-D1-FL-03	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Foreign language (German)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Ways of assessment	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation.											

WIP-MDL-D1-SMIES-03	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Statistical methods in engineering sciences	15	15							30	3	K_W01 K_W03 K_U04 K_U05 K_K02	Materials engineering
Course content	Characteristics of the statistical research process. Stages of statistical research. Determining the values of measures of the distribution of a feature in a sample, including the measures of position, differentiation, asymmetry and concentration. The use of descriptive statistics methods in engineering sciences. Random variable and basic distributions of random variables. Exact and boundary distributions of sample statistics. Point and interval estimation. Determining the minimum number of measurements in relation to the postulate of representativeness of the statistical sample. The use of interval estimation methods in engineering sciences. Parametric tests in the verification of statistical hypotheses expressed by the arguments of classical data distributions or structure indexes. Nonparametric tests of verification of statistical hypotheses. The use of hypothesis verification theory methods in engineering sciences. Computer statistical packages used in engineering statistics. Acquainting students with the rules of passing the course. Designing a statistical survey. Collection and presentation of statistical data. The use of descriptive statistics methods to analyse engineering problems. Analysis of engineering problems with the use of basic statistical distributions. Analysis of engineering problems using exact and boundary distributions of sample statistics. Estimation of											

	parameters of the general population on the basis of a statistical sample. The minimum sample size for the assumed measurement accuracy. The use of selected parametric tests in engineering sciences. The use of selected non-parametric tests in engineering sciences. The use of the knowledge of sample statistical calculations.											
Ways of assessment	Final test.											
WIP-MDL-D1-ES-03	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Engineering statistics	15	15							30	3	K_W01 K_W03 K_U04 K_U05 K_K02	Materials engineering
Course content	Characteristics of the statistical research process. Stages of statistical research. Determining the values of measures of the distribution of a feature in a sample, including the measures of position, differentiation, asymmetry and concentration. Random variable and basic distributions of random variables. Exact and boundary distributions of sample statistics. Point and interval estimation. Determining the minimum number of measurements in relation to the postulate of representativeness of the statistical sample. Parametric tests in the verification of statistical hypotheses expressed by the arguments of classical data distributions or structure indexes. Nonparametric tests of statistical hypothesis verification. The use of statistical methods in production management. Designing a statistical survey. Collection of statistical data. Presentation of statistical data.											

	Determination of measures of the position of a sample data set. Determination of dispersion measures for a sample data set. Determining the asymmetry measures of the sample data set. Concentration and flattening of a sample set. Data analysis with the use of known descriptive statistics - independent work. Analysis of the basic distributions of random variables. Use of exact and borderline distributions of sample statistics in tasks. Estimation of parameters of the general population on the basis of a statistical sample. The minimum sample size for the assumed measurement accuracy. Performing the test for the population mean value. Performing a significance test for two means. Performing the test for the general population variance. Performing a test for two variances. Carrying out the test for the population structure index. Carrying out a significance test for two structure indicators. Perform a hypothesis verification test for the distribution analysis. The use of the knowledge of engineering statistics.
Ways of assessment	Final test.

WIP-MDL-D1-BOAAR-03	**Form of classes – number of hours**								**Total number of hours**	**Totalnumber of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Basics of automation and robotics	15	15	15	15					60	5	K_W03 K_W05 K_U03 K_U04 K_U05 K_U06 K_U08	Materials engineering

											K_U09 K_K02	
Course content	Automation and tasks of automation devices. Characteristics of basic concepts. Structure and classification of automatic control systems. Elements and components of automation. Control of continuous processes. Controllers. Binary and digital control. Programmable controllers. Industrial robots - characteristics, construction and division. Grippers and manipulators. Robotization of selected processes. Kinematics and robot control. Programming robots. Analysis of the operation of control systems and automatic regulation. The use of IT tools in modelling and simulations of automation and robotics systems. Problem analysis of issues related to the automation of robotization of selected processes. Testing of selected elements and components of automation as well as automatic control and regulation systems. Programming of digital control systems and automatic control with a PLC controller. Controlling manipulators and programming of robots. Computer visualization and control of technological processes. Technical and functional analysis of design tasks. Selection of components and technical means necessary to automate or robotise a selected process. Development of control algorithms. Synthesis and evaluation of project tasks and their documentation.											
Ways of assessment	Colloquium, test, project.											

WIP-MDL-D1-MW-03	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Modern warehouses	15	15	15	15					60	5	K_W02 K_W03 K_W05 K_U04 K_U05 K_U09 K_K02	Materials engineering
Course content	Warehouse and warehousing - characteristics of basic concepts and normative acts. Characteristics of selected storage processes. Construction and arrangement of warehouses. Technical equipment of warehouses Organization and safety of work in warehouses. IT tools used for warehouse management. Automation and robotization of warehouse operations. Discussion of the subject of calculating exercises and the tools used. Problem and technical analysis of storage-related processes. Analysis of storage efficiency and costs. Familiarization with the operation of measuring instruments and software. Examination of selected elements, devices and systems of technical and IT equipment in modern warehouses. Modelling and simulation of selected processes related to storage. Functional and technical analysis of design tasks. Selection of the storage process. Selection of warehouse layout. Selection of warehouse technical equipment components. Synthesis and evaluation of project tasks and their documentation.											
Ways of assessment	Colloquium, tests, project.											

Year of study: the second **Semester**: the third

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Year of study: the second **Semester**: the fourt

WIP-MDL-D1-PDOM-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Process design of materials	15			30					45	4	K_W02 K_U04	Materials engineering
Course content	Basic concepts and definitions related to process design. Measures of economic efficiency of production, profitability of the enterprise. Characteristics of the components of the process design. Schematic diagram of the process with material and energy balance. A diagram of the course of technology along with the determination of the amount of emissions. Stages of constructional preparation of production. Technology optimization. Preparation of design and technological documentation. Preparation of an industrial technology project of a selected method in iron metallurgy. Preparation of an industrial technology project of the selected method in aluminium metallurgy. Development of a process diagram along with a material and energy balance. Design of industrial recycling technology. Design of industrial metal recovery technology.											
Ways of assessment	Test, project, exam.											

WIP-MDL-D1-MAMR-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Marketing and marketing research	15	15							30	2	K_W07 K_U04	Management and quality sciences
Course content	The essence of marketing. Product. Price. Distribution. Special offer. Market segmentation. Consumers and their behaviour on the market. Marketing information system. Marketing plan. The essence of marketing. Marketing research. Industrial Marketing. Marketing of services. E - Marketing. Marketing in international exchange. Price strategy. Distribution of goods. Promotion as a marketing tool. Information systems in marketing.											
Ways of assessment	Test.											

WIP-MDL-D1-PAPIS-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Packaging and product identification systems	15		15						30	2	K_W02 K_W03 K_W06	Management and quality sciences

											K_W07 K_U02 K_U04 K_U07 K_K01 K_K02 K_K04	
Course content	Introduction to the subject of packaging. The packaging process as part of the logistics system. Areas of application of packaging. Definitions and classification of packaging. Functions of packaging. Requirements placed on packaging in logistic processes. Obligations of the packaging producer introducing packaging into the economic cycle. Marking of packaging, products. Packaging in logistic chains. Packaging in the economic cycle Materials used for packaging manufacture. Packaging design guidelines. Packaging waste. Characteristics of packaging waste. Packaging waste management systems. Identification and evaluation of packaging properties used for product protection. Identification and evaluation of the properties of packaging auxiliaries used to protect products. Analysis and evaluation of selected product packaging techniques. Ways of labelling packaging and products. Design of packaging and labelling. The packaging process. Packaging from a logistics perspective. Packaging cycle in the supply chain. Pallet load units - types, physical, mechanical and functional properties. Circulation of loading units. Dimensional interdependence of pallets, means of transport and storage space.											
Ways of assessment	Report, test.											

WIP-MDL-D1-PM-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Polymer materials	30		15						45	3	K_W03 K_W04 K_W05 K_U03 K_U08 K_U09 K_K02 K_K03	Materials engineering
Course content	Outline of the development of polymeric materials and basic concepts: molecular weight and degree of polymerisation. Polymer production, raw materials, types of polymerisation and modification, technical polymerisation methods. Basics of polymer classification and nomenclature. Additional components of polymeric materials and their characterisation. Polymer physico - chemistry and crystallisation. Characteristics of the more important polymers. Properties of polymeric materials. Polymer composites. Fundamentals of polymer materials processing and recycling. Identification of polymeric materials. Determination of the degree of polymerisation - analytical tasks. Investigations of basic physical properties. Using CES software to find information on different polymers and their processing. Resins. Manufacture of a polymer matrix composite. Investigations into the mechanical properties and structure of polymeric materials. Depolymerisation of methyl methacrylate. Printing of polymer products.											

Ways of assessment	Laboratory reports, tests											
WIP-MDL-D1-COM-04	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Composites	30		30						60	3	K_W04 K_U03 K_K02	Materials engineering
Course content	Outline of the development of composite materials, basic concepts and definitions. Components and their characteristics. Basics of designing composites reinforced with particles, continuous and short fibers. Types of interfaces between components, their role and test methods. Technologies for the production of polymer, metal and ceramic matrix composites. Selected structural aspects of composites and their influence on the properties of the final elements. Forecasts of the directions of development of composites (taking into account economic and ecological aspects). Composite density and component volumetric fractions. Analysis of selected reinforcement materials. Designing composites with a variable volume fraction of the reinforcing phase. Structural analyzes of selected composites. Investigation of selected properties of composites.											
Ways of assessment	Tests, reports.											

WIP-MDL-D1-LC-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Logistics centres	15	15							30	2	K_W01 K_W02 K_W06 K_W07 K_W08 K_W09 K_U07 K_U08 K_K01 K_K02 K_K03 K_K04	Management and quality sciences
Course content	Logistics centre - overview of definitions. Differences between logistics center and distribution center. Purpose and scope of activities of the logistics centres. Sources of financing for the construction and development of centres in Poland. The public-private partnership formula as a source of financing for the construction and development of logistics centres in Poland. The role of the logistics centre in coordinating and consolidating transport flows. Overview of the concepts of multimodal and intermodal transport - differences. Logistics centres are a driving force for the development of multimodal transport. Possibilities for developing inland ports in Poland											

	as logistics centres. Nature and forms of balancing invoices. Logistics centers worldwide. The nature and role of logistics centres in large supply chains. Development trends in logistics centres. Development strategies of logistics centres based on examples.											
Ways of assessment	Presentation, written examination.											
WIP-MDL-D1-ELC-04	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Enterprise logistics costs	15	15							30	3	K_W02 K_W06 K_W07 K_U07 K_U09 K_K02 K_K03	Management and quality sciences
Course content	The essence and concepts of logistics costs. Classification cross-sections of logistics costs. Model approach to logistics costs - transport and inventory costs. Model approach to logistics costs - costs of IT processes. Logistics cost interdependence and partial cost conflict. Global logistics costs. Logistics costs in the company's accounting system. Basic cost indicators for the evaluation of logistic processes in an enterprise. Logistic customer service costs. Specification of cost calculation in transport activity. Calculation of the costs of the transport order. Minimization of transport costs in the logistics system. Calculation and optimization of warehouse and storage space costs. Inventory costing. Calculation of the global costs of the company's											

	logistics. Application of investment effectiveness assessment methods (NPV, IRR) to verify the decision on the purchase of means of transport by an enterprise.
Ways of assessment	Test.

WIP-MDL-D1-FL-04	**Class type – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for the whole programme**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field class	Seminar	Internship	Others				
Foreign language (English)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Methods of assessment of learning outcomes	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation.											

WIP-MDL-D1-FL-04	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Foreign language (German)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Ways of assessment	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation.											

WIP-MDL-D1-DAMOP-04	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Design and manufacture of products in 3D printing technology	15		30						45	3	K_W01 K_U04	Materials engineering

Course content	History of the development of 3D printing methods. 3D printing methods. Fundamentals of additive manufacturing techniques. Introduction to rapid prototyping methods. 3D Scanners. Materials used in 3D printing. Biofilters and bio-printing. Stereolithography. STL file format. Assessment of 3D printing parameters and their impact on product quality. Defining surfaces in 3D systems. Advanced methods of solid modelling. Advanced techniques of 3D modelling. Preparation of a file for 3D printing. Geometric modelling with CAD tools. Optical methods of mapping objects - 3D scanning. Modelling based on a 3D scan. Preparation of digital 3D CAD models based on 3D scans. Analysis of material properties. Making 3D prints - preparing a model in STL format, printing the model, processing 3D prints from plastics, assessing dimensional and shape accuracy.
Ways of assessment	Tests.

WIP-MDL-D1-MOPWT-04	**Form of classes – number of hours**								**Total number of hours**	**Totalnumber of ECTSpoints**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Manufacture of products with the use of incremental methods	15		30						45	3	K_W01 K_U04	Materials engineering
Course content	History of the development incremental methods. Incremental methods. Fundamentals of manufacturing products using incremental methods. Methods of rapid prototyping. 3D scanners. Materials used in additive technologies. Stereolithography. Biofilters and bio-printing. Preparation of file in STL format. Influence of 3D printing parameters on product quality. Defining surfaces in 3D modelling systems. Advanced solid modelling methods. Preparation of a file for 3D printing. Introduction to laboratory activities. Geometric modelling with CAD software. Object mapping methods - 3D scanning. Modelling of objects based on a 3D scan. Creating digital											

	CAD spatial models. Analysis of properties of materials used in additive methods. Printing with incremental methods - model preparation in STL format, model printing, processing of 3D plastic prints, assessment of the dimensional and shape accuracy of products obtained with incremental methods.											
Ways of assessment	Tests.											
WIP-MDL-D1-PM-04	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Personnel management	15	15							30	2	K_W07 K_U07 K_K02	Management and quality sciences
Course content	The role of the human factor in enterprise management processes. Characteristics of basic models of human resource management. Types of personnel strategies and their integration with the basic strategy of the company. The concept of the labor market and the factors influencing the demand and supply of human resources. Characteristics of the concept of organizational culture. The role of norms and patterns of behavior in people management. Methods and techniques of work analysis. Impact of job analysis results on current and future human resource activities. Types of planning in the field of human resources. Information sources and techniques of human resource planning. Recruitment of employees. The procedure of the recruitment process on the internal and external market. The course of activities in the selection of candidates. Interview Guidelines. Employee evaluation system, its goals and functions, as well as evaluation criteria and methods. The concept and theories of motivating. Principles of applying effective motivation. The concept of human capital. Methods and techniques of its evaluation and development. Elements of a human resource management system.											

	Identification of the components of personnel functions in the enterprise. Organization of the personnel department in the enterprise. Factors shaping the labor market. External labor market and employment conditions legislation. Analysis of the employment structure, level of fluctuation and labor costs. The impact of organizational culture on the functioning of the organization. The relationship between organizational culture and the company's functioning on the market. Identification of strategic competences and determining their impact on the company's performance. Creating competence portfolios of job positions and employees. The use of mathematical and statistical methods for quantitative employment planning. Work valuation with the use of analytical - point and summary methods. Analysis of the value of intellectual capital of the enterprise.
Ways of assessment	Final test.

WIP-MDL-D1-DOM-04	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Developing of management	15	15							30	2	K_W07 K_U07 K_K02	Management and quality sciences
Course content	Etymology and meaning of the concept of management. The concept of power, its sources and methods of use. The division of management styles in different perspectives. Psychological determinants of people's behavior at work. Characteristics of the basic personal patterns of managers. Analysis of basic errors in the management process. Building employee teams. Group development phases. Analysis of the roles performed by the group participants. The importance of the proper selection of employees from the point of view of the effectiveness of employee teams. Methods of analyzing and resolving conflicts in organizations. Characteristics of the basic											

	techniques of managing employee teams. Analysis of the strengths and weaknesses of individual solutions. Possibilities of using selected models in specific work situations. Personal marketing. Basics of negotiating. Shaping human capital in enterprises. Human resource management in international organizations. Analysis of factors influencing the effectiveness of the management process. Resource management - analysis of the effectiveness of approaches and methods. Sieve and human capital models in the process of employment planning. Leadership styles in the people management process. Personnel formation in the enterprise. Motivating the human resources of the enterprise. Controlling and promoting staff in the enterprise (evaluation methods). Personality analysis of management representatives. Importance of leadership and social skills of managerial staff. Economic and financial analysis of human capital in an enterprise.
Ways of assessment	Final test.

WIP-MDL-D1-EP-04	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Engineering practice									100	4	K_W03 K_W04 K_W05 K_W06 K_U04 K_U05 K_U06 K_U07	Materials engineering

											K_K01 K_K02 K_K03 K_K04	
Course content	The Occupational Health and Safety training specified in the workplace regulations. Fulfillment of the internship curriculum content under the guidance of the company's internship supervisor.											
Ways of assessment	Evaluation of the internship supervisor with the grade noted in the Internship Journal. Evaluation of the internship completion given by the Dean's Representative on Internship.											

Year of study: the second **Semester**: the fourth

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Year of study: the third **Semester**: the fifth

WIP-MDL-D1-ERM-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Enterprise resource management	15	15		15					45	3	K_W07 K_U04 K_U06 K_U07 K_K01	Management and quality sciences
Course content	Introduction to the subject of resources, enterprise resource management, resource theory of organization. The theory of resources and competences, resource approach to enterprise strategy. Human resources, material. Financial. Information and knowledge resources. Intangible resources: market, relational and organizational. Criteria and methods of resource assessment. Resources in creating the competitiveness of the enterprise. Improving the structure of resources. Quantitative and qualitative analysis and optimization of the company's human resources. Research on organizational resources. Analysis of the company's knowledge resources. Streamlining the processes of creating and disseminating knowledge. The main indicators of the economic analysis of the enterprise. Resource assessment using the VRIO model. Identifying the strengths and weaknesses of the company by making a strategic balance sheet. Capacity requirements planning. Strategic balance of the enterprise. Research on organizational resources. Enterprise human resources analysis. Capacity requirements planning. Strategic balance of the enterprise. Research on organizational resources. Analysis of the company's human resources. Financial analysis. Assessment of resources using the VRIO											

	model. Capacity Requirement Planning. Application of methods of research and development of enterprise knowledge resources.											
Ways of assessment	Test, presentation project, colloquium.											
WIP-MDL-D1-PD-05	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Product design	15			30					45	4	K_W02 K_W03 K_W04 K_W07 K_U04 K_U06 K_K03	Management and quality sciences
Course content	The concept and structure of the product. Classification of products. Product life cycle. product life cycle costs and income. Strategies of entry and exit. Criteria for forming the range of products. Introduction to rapid prototyping methods. Packaging and its importance in product design. Factors effectively affecting a potential customer (color, shape, size, material, text, illustrations). Market analysis. Product planning. Stages in product development. Generating ideas. Initial selection of ideas. Materials. Selection of materials. Production processes. Preliminary study design and tests. Marketing and economic analyzes. Product launch. Compare products. Introduction to design activities. Product life cycle. Product Life Cycle Costs and Income. A comparative analysis of several products of the same purpose. Changes to an existing product - redesign of											

	an existing product in order to improve its functional, visual and design properties. Identification and selection based on market analysis of a design product. Comparison of products available on the market. Stages in product development. Generating ideas. Initial selection of ideas. Properties and determination of material resources for the selected product. Materials. A proposal for the selection of materials, taking into account the processing technology. Preliminary design of the study and tests. Selection of the production process. Marketing and economic analyzes. Methods and techniques of product quality assessment. Packaging and its importance in product design. Factors that effectively affect a potential customer (color, shape, size, material, text, illustrations). Development of the concept and definition of the functions of the packaging of the designed product.
Ways of assessment	Colloquium, project.

WIP-MDL-D1-LOD-05	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Logistics of distribution	15	15							30	3	K_W01 K_W02 K_W06 K_W07 K_W08 K_W09 K_U07 K_U08	Management and quality sciences

											K_K01 K_K02 K_K03 K_K04	
Course content	General theory of the basics of logistics, extraction of the distribution logistics subsystem and classification in the supply chain. Object and scope and characteristics of distribution logistics. Total logistics costs including a list of all costs related to distribution logistics. Nature and structure of distribution channels. Design of distribution channels. Interactions and conflicts in the distribution channels. Prices and pricing in the distribution channels. Marketing tools in distribution logistics. Distribution policy: sales method, commercial services, delivery service. Characteristics of wholesale and retail trade. Communication policy: advertising, public relations, sales promotion, direct sales. Logistics management in the goods distribution processes. Use of word-based activation teaching methods Work with the book, solve tasks and discuss how distribution logistics works. Presentation of the results of the realized questions in the field of distribution logistics. Explanation of the conclusions proposed by the tutor on the issues of distribution logistics.											
Ways of assessment	Test, written examination.											

WIP-MDL-D1-FL-05	**Class type – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for the whole programme**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field class	Seminar	Internship	Others				
Foreign language (English)		30							30	2	K_W09 K_U01 K_U09	Materials engineering

											K_K04	
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Methods of assessment of learning outcomes	End-of-semester assessment (oral, descriptive, test - based or other), achievement tests, written assignments, group and individual student presentations, class participation.											
WIP-MDL-D1-FL-05	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Foreign language (German)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework.											
Ways of assessment	End-of-semester assessment (oral, descriptive, test - based or other), achievement tests, written assignments, group and individual student presentations, class participation.											

WIP-MDL-D1-WPM-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole Program	Discipline(s) to which the course relates
	Lecture-	Classes	Laboratory	Project -	Field activities	Seminar	Internship	Others				
Work process management	15	15							30	3	K_W02 K_W07 K_U06 K_K01	Management and quality sciences
Course content	The concept and essence of work, structure and features of the enterprise. Characteristics of the basic information flow channels in the work environment. Basic forms of work organization. Organization of the workplace. Characteristics of the elements of the material work environment. Methods of organizing working time. Job valuation. Workplace research methods. Statistical control of the production process. Methods of measuring working time. Working time standardization. Analysis of labor costs and employment structure. Employee performance analysis. Employee performance analysis.											
Ways of assessment	Test/ colloquium, exam.											

WIP-MDL-D1-OAMOP-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Organization and management of production processes	15	15							30	3	K_W02 K_W03 K_W05 K_U04 K_K01	Management and quality sciences
Course content	Characteristics of the production process. Types and elements of the production process. The technological cycle and the production cycle, characteristics and structure of the cycle. Schedules of the production process. Planning and control of production flow. Lengths of the production cycle. Work in progress. Continuous flow. Managing production capacity. Methods of operation synchronization in the production process. APS systems. Flexible production systems. Production planning and management systems (MES, ERP). Means of production in various branches of the economy. Production system. Characteristics, specific features and classification of typical systems, processes and production techniques. Determining the time of implementation of technological operations. Methods of increasing the productivity of processes. Risk in planning production orders. Design of production systems. Construction of schedules for the course of production processes. 5S Practices. Lean Manufacturing. Total Quality Management, Six Sigma. Kaizen - continuous improvement,"5 × why?". Balancing the assembly line. Total equipment efficiency. Means of production used in various branches of the economy.											
Ways of assessment	Colloquium, exam.											

WIP-MDL-D1-LI-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Logistics infrastructure	15	15							30	2	K_W01 K_W02 K_U04 K_K01	Management and quality sciences
Course content	Introduction to issues related to logistics infrastructure, basic terms. Division and main elements of logistics infrastructure. Logistics infrastructure - basic concepts. Logistics infrastructure - broken down by branches. Storage and handling infrastructure. The role of logistics centers in the logistics infrastructure. Packaging infrastructure. IT infrastructure. Logistics system, process and structure. Division of logistics infrastructure. Logistics centres versus logistics infrastructure. Demonstrate how to solve storage decision-making tasks. Solving storage tasks. Solving tasks on transport decisions, helping to choosing the right mode of transport. Solving tasks relating to transport decisions. Selecting a suitable site for logistics facilities. Demonstration of how to solve tasks with topics on location decisions. Addressing the issue of packaging infrastructure. Case study on logistics infrastructure in terms of IT systems used.											
Ways of assessment	Test, colloquium.											

WIP-MDL-D1-MMT-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Modern manufacturing techniques	30		30	30					90	7	K_W03 K_W04 K_U03 K_U04 K_U05 K_K02	Materials engineering
Course content	Manufacturing techniques of modern steels and metal alloys. Environmental aspect in metal production technologies. Modern technologies for the production of castings. Machines and devices in modern foundries. BAT technologies in metal plants. Modern technologies for the production of plastically processed products. Machines and devices in modern plastic forming plants. Modern techniques of rapid prototyping. Industrial measuring systems. Design of technological processes. Measurement techniques in the metal industry. Experimental determination of the transition zone during continuous casting of slabs/Experimental determination of the hydrodynamic structure in the COS crystallizer. Observation of steel smelting and continuous casting in industrial conditions - fieldwork/Experimental determination of the relationship between the basicity of slag and the degree of desulphurization of the liquid iron alloy/ Sintering of iron ore. Centrifugal, precision and pressure casting. Modern materials for foundry molds and castings. Drawing and rolling. Conducting tests of mechanical properties for selected plastic worked elements. Carrying out upsetting tests.											
Ways of assessment	Final test of the lecture and laboratory, project preparation for credit.											

WIP-MDL-D1-RADP-05	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Reporting and data presentation	15		30						45	4	K_W01 K_U04	Materials engineering
Course content	Type and nature of process data. Structures and properties of process data processing systems. Processing and transmission of data from sensors in industry. Data exchange formats. Measurement error and uncertainty of measurement results. Statistical analysis of measurement data. Probability distributions. Data smoothing, reduction and compression. Concepts of interpolation, approximation and extrapolation of measurement data. Regression analysis and correlation. Preparation of reports and summaries. Methods of graphical data presentation. Working in a spreadsheet. Processing and statistical analysis of measurement data. Preparation of reports. Visualization of measurement data. Development and graphic presentation of research results. Preparation of data presentation.											
Ways of assessment	Test.											

WIP-MDL-D1-TI-05	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				

Transport infrastructure	15	15							30	2	K_W01 K_W02 K_U04 K_K01	Management and quality sciences
Course content	Presentation of basic concepts and terms related to transport infrastructure. Specifics of road transport infrastructure. The specificity of railway transport infrastructure. Specifics of air transport infrastructure. Specifics of water and inland transport infrastructure. Specifics of transmission infrastructure. Trends in the development of transport infrastructure. Comprehensive analysis of selected types of transport infrastructures. Activities of transport infrastructures for the development of national and international transport - presentation of a comparative analysis, discussion. Presentation and discussion of the functioning of enterprises based on the infrastructure used - the case study. Critical discussion of the presented topics in terms of the assessment of road, rail and air transport infrastructure (presentations in electronic form). Critical discussion of the presented topics in terms of the assessment of water, inland and transmission infrastructure (presentations in electronic form).											
Ways of assessment	Test, colloquium.											

Year of study: the third **Semester**: the fifth

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Year of study: the third **Semester**: the sixth

WIP-MDL-D1-LM-06	Form of classes – number of hours								Total number of hours	TotalNumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Lean management	15	15		15					45	3	K_W02 K_W03 K_W07 K_W08 K_U04 K_U05 K_K03	Management and quality sciences
Course content	Introduction to Lean Management & Manufacturing. Process improvement and Lean tools. Value stream mapping. Business models for Lean Manufacturing. Lean culture. Application of selected Lean methods and tools in processes. Visual stream mapping and future state map. Case study analysis and discussion. Project using Lean methods and tools.											
Ways of assessment	Colloquium, project.											

WIP-MDL-D1-FL-06	Class type – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for the whole programme	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field class	Seminar	Internship	Others				
Foreign language (English)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering
Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework. Exam preparation.											
Methods of assessment of learning outcomes	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation, written exam.											
WIP-MDL-D1-FL-06	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Foreign language (German)		30							30	2	K_W09 K_U01 K_U09 K_K04	Materials engineering

Course content	Work skills. Professional language in the workplace. Communicative and lexical exercises. Business correspondence. Language structures in use. Specialised text. Audiovisual coursework. Exam preparation.											
Ways of assessment	End-of-semester assessment (oral, descriptive, test-based or other), achievement tests, written assignments, group and individual student presentations, class participation, written exam.											
WIP-MDL-D1-RPT-06	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Rapid prototyping technologies	30		15	15					60	5	K_W02 K_W05 K_W06 K_U01 K_U02 K_U05 K_K01 K_K02	Materials engineering
Course content	Introduction to rapid prototyping technology. Fundamentals of additive manufacturing techniques. Fundamentals of manufacturing techniques with the use of subtractive machining. Incremental shaping technology. Coding of CNC devices and 3D printers. Materials and techniques used in 3D printing technology. The use of CNC machines for rapid prototyping. Rapid prototyping with the use of ceramic materials. The use of rapid prototyping techniques in foundry. Model and mold technology, preparation of unit and serial production. Preparation of object models in the CAD program. Designing assemblies of elements and their cooperation. Possibilities, use											

	and limitations of 3D scanning techniques. Coding of CNC devices and 3D printers. Printing parameters in the context of the materials used for 3D printing. Fabrication of component models with the use of 3D printers. Getting to know the CAM environment - virtualization of machine tool operation. Manufacturing of component models with the use of CNC machine tools. Preparation of models and molds for rapid prototyping of ceramic materials. Research on the mechanical and technological properties of model and molding core sands used in foundry rapid prototyping methods. Development of the project for the assembly of cooperating elements and verification of the project with the use of 3D printing technology. Development of a CAD model of a selected element and preparation of a CAM project for a numerical machine tool. Development of prototyping technology for the production of prototype elements from ceramic materials. Application of rapid prototyping techniques in the design of foundry models, molds and tooling. Preparation of object models in the CAD program.
Ways of assessment	Colloquium, project.

WIP-MDL-D1-DAMS-06	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Design and materials selection	30		30						60	4	K_W03 K_U09 K_K02	Materials engineering
Course content	Design process: function, material, shape and technology. Classification of materials used in engineering practice and their properties. Methods of presenting the properties of material. Materials indices. Procedure determining for materials indices without shape factor. Materials indicators with shape factor. Selection of manufacturing technology, joining and surface treatment. Economical aspects of choice of technology depending on the batch size. Ecological and environmental aspects of selection. Golden rules of designing. Obtaining of materials data during selection process. Introduction to CES Edu Pack. Solving problems of material selection using property charts. Determining functionality indicators. Selection of materials based on one design criterion. Multi - criteria determination of functionality and material selection indicators. Determination of functionality indicators taking into account the shape of the finished product. Selection of methods and processes of manufacturing products, taking into account the bath size of production.											
Ways of assessment	Test and problems solutions set.											

WIP-MDL-D1-TEOTO-06	Form of classes – number of hours								Total number of hours	Totalnumber of ECTSpoints	Outcomes defined for whole program	Discipline(s) to which the courserelates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
The efficiency of the organization's functioning	15	15							30	3	K_W02 K_W03 K_W07 K_W08 K_U04 K_U05 K_K03	Management and quality sciences
Course content	Introduction to the issues of the effectiveness of the functioning of the organization. Characteristics of various approaches to the analysis and evaluation of the effectiveness of the organization's functioning. Methods of assessing the effectiveness of the organization's functioning. Methods of improving the effectiveness of the organization's functioning. Instruments for measuring production efficiency. Methods and techniques for organizing production used to improve the efficiency of the enterprise. The use of selected methods and tools to assess the functioning of the organization. Difficulties in measuring and assessing the effectiveness of the organization's functioning. Performance Improvement Programs. Case Study Analysis and Discussion.											
Ways of assessment	Colloquium.											

WIP-MDL-D1-IACT-06	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Information and communication technologies in logistics	15	15							30	2	K_W01, K_W02, K_W06, K_W07, K_U04, K_U05, K_U07, K_K01, K_K02, K_K03,	Management and quality sciences
Course content	Information and communication technologies in the processes of processing, collecting and transmitting information. Characteristics of the use of information and communication solutions in logistics. The role of information in modern companies implementing logistic processes. Elements of IT system management in logistics. The role of IT systems and tools for the effective functioning of logistics companies. IT systems supporting logistic processes. Modern ICT solutions for logistics. Information technologies in transport systems. Logistics in shaping the value chain. Information security management in logistics. Text processing in solving logistic problems, creating documents. The use of sheet-fed applications to solve logistics problems. Optimization issues with the use of a spreadsheet. Working with objects in creating interactive presentations. Applications of office software in a computing cloud in terms of use in a logistics company. Operation of a database system in a computing cloud. Implementation of the selected content management system. The content management system environment and methods of its creation. Presentation of the website of the selected logistics company.											
Ways of assessment	Task, test.											

WIP-MDL-D1-LPM-06	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Logistics project management	15			15					30	2	K_W05 K_W06 K_W07 K_W08 K_W09 K_U04 K_U07 K_K02 K_K03	Management and quality sciences
Course content	Introduction to logistics project management: history of logistics project management, the concept of a logistics project, types of projects and their importance for the organization, project goals. Basic elements of logistics project management: knowledge areas of logistics project management, logistics project management system, forms and stages of project management, the essence of project and project management. Project stakeholders. Characteristics of the project life cycle, success factors and reasons for the failure of a logistics project. Presentation of groups of logistics project management processes: initiation and definition, planning, implementation, control, closing. Aim of the project - definition and characteristics. Project scope management process. Project time management process. Project cost management process. Risk management in the project. Logistics project closure: closure processes, project documentation, post-project reports. Introduction											

	to the subject matter, defining the logistics project and its characteristics. Presentation of the rules for the implementation of the logistics project and discussion of the project plan. Project start - Company selection and characteristics (basic information, employment and organizational structure). Description of the scope of the company's activity and logistics processes taking place in it. Identification of the company's needs in the field of logistics projects. Study of the company's logistics system, mapping of logistics processes in the enterprise, best logistics practices, logistics benchmarking. Identification of the purpose of the project. Diagnosis of the state of the enterprise and identification of the logistics process being the subject of design 1h. Project stakeholders. Criteria of success, responsibility matrix, principles of working in the project. Scope of the project. Logistics Project Planning: Work Breakdown Structure (WBS). Constructing the project schedule. Planning project deadlines (task time estimation). Logistics project budgeting. Identifying the resources necessary to implement the project. Risk assessment in the project. Project closure: closure processes, project documentation, final reports.
Ways of assessment	Assessment of the implementation of tasks included in the curriculum, assessment of the mastery of the teaching material being the subject of project tasks, assessment of the mastery of the teaching material within the lectures - final test.

WIP-MDL-D1-SOMP-06	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Shaping of materials properties	15		15						30	4	K_W04 K_U08 K_K02	Materials engineering

Course content	Issues concerning the relationship between the structure, properties and the manufacturing process. Shaping of the structure and properties by plastic deformation. High effective plastic deformation. Shaping of the structure and properties using powder metallurgy: manufacturing of powders, preparing, cold forming, sintering and finishing techniques. Techniques of the structure and properties shaping of surface engineering materials PVD, CVD techniques. Shaping of the structure and properties by casting technologies. Investigations of the structure and properties of materials created by plastic deformation. High effective plastic deformation. Investigations of the structure and properties of materials created by powder metallurgy. Investigations of the structure and properties of surface of materials created by CVD and PVD techniques. Investigations of the structure and properties of materials created by casting technologies.
Ways of assessment	Colloquium, exam.

WIP-MDL-D1-OR-06	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Operational research	15		15						30	2	K_W01 K_W03 K_U04 K_U05 K_K02	Management and quality sciences
Course content	Scope and applications of operations research. Mathematical model of the decision problem. Examples of issues. Supporting decision-making processes using mathematical programming methods. Basic programs in the field of mathematical programming. Linear programming problem. The graphic method and its various											

	solutions. Dual program. Issues: allocation (work), production line, cutting and loading. Simplex method. Integer programming. The method of division and constraints. Transport algorithm. The problem of maximum flow in networks. Action networks. Planning of projects. CPM method. Elements of game theory. Two-player zero-sum games. Optimal strategies. Games with nature. The use of operational research methods in production management. Acquainting students with the rules of passing the course. The scope and application of operations research. Structure of a mathematical programming problem. Graphical method of solving linear programming problems. Application of a dual program to solve linear programming problems using the graphical method. Application of the known tools to solve problems related to: division of labor, cutting and unloading. Simplex method of solving linear program problems. Application of the transport algorithm. Project planning. Application of the CPM method.
Ways of assessment	Final test.

WIP-MDL-D1-QMIM-06	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Quantitative methods in management	15		15						30	2	K_W01 K_W03 K_U04 K_U05 K_K02	Management and quality sciences
Course content	The scope of the subject of quantitative methods in management. Basic quantitative methods. Linking the subject matter with the subject of statistics. Assessment of cause and effect relationships between phenomena.											

	Study of the dynamics of phenomena. Individual and aggregate indices. Building time trends and analysis of seasonal fluctuations. Econometric modelling. Stages of econometric modelling. Types of econometric models. Linear econometric models. Selection of variables for linear econometric models. Construction and evaluation of linear econometric models. Forecasting on the basis of linear econometric models. Nonlinear modelling. Production function. Elements of linear programming and the simplex method as an example of analytical management models in a company. Use of computer tools. The use of quantitative methods in production management. The use of computer methods in quantitative methods in management. Graphical presentation of the results used in quantitative methods in management. Assessment of the dependence of phenomena using correlation coefficients: quantitative and qualitative variables. Linear regression function - construction and evaluation of models. Assessment of the dynamics of phenomena - individual increments and indexes, aggregate indexes. Assessment of the dynamics of phenomena: construction of a linear trend and a model of seasonal fluctuations in time. Construction of a linear econometric model - methods of selecting variables for the model. Construction of a linear econometric model - estimation of model parameters using the least squares method. Construction of a linear econometric model - checking the model assumptions. Construction of an econometric model - using models in enterprise management. Elements of construction of econometric nonlinear models. Production function and its interpretation. The use of computer tools to solve linear programming problems. The use of statistical analyses to evaluate the company's operations. The use of a selected model.
Ways of assessment	Final test.

WIP-MDL-D1-KM-06	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Knowledge management	15	15							30	3	K_W07 K_U07 K_K02	Management and quality sciences
Course content	Types of knowledge in organizations. Objectives, benefits and barriers of knowledge management. Characteristics of the basic models of knowledge management in enterprises. Characteristics of knowledge management elements. Types of knowledge. Strategies for managing personalized and codified knowledge. Basic methods of knowledge measurement. Methods of knowledge management. The impact of knowledge management on the value of intellectual capital in enterprises. Directional audit of knowledge management in enterprises. Basic aspects of the knowledge-based economy. Typology of knowledge in selected types of organization. Methods of knowledge codification. Identification of tacit and intuitive knowledge in organizations. Shaping employee competency portfolios. Identifying the knowledge gap. Computerization of management and communication processes in enterprises. The importance of managerial staff in knowledge management processes. The role of the leader. Shaping work organization based on team work and exchange of experiences. Analysis of the ethical and organizational aspect of knowledge sharing within the organization. External sources of knowledge. Search for knowledge.											
Ways of assessment	Final test.											

WIP-MDL-D1-ICM-06	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Intellectual capital management	15	15							30	3	K_W07 K_U07 K_K02	Management and quality sciences
Course content	Contemporary approach to intellectual capital. The influence of intellectual capital on the efficiency of the enterprise. Human capital. Structural capital. Relational capital. Valuation of the value of intellectual capital. Knowledge management in the process of shaping intellectual capital. Analysis of human capital. Identification and evaluation of the components of the company's structural capital. Shaping relations with suppliers and recipients in the context of intellectual capital management. Methods of intellectual capital valuation.											
Ways of assessment	Final test.											

Year of study: the third **Semester**: the sixth

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Year of study: the fourth **Semester**: the seventh

WIP-MDL-D1-PFTT-07	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Preparation of the diploma thesis and preparation for the diploma exam										10	K_U04 K_U09 K_K02	Materials engineering
Course content	Development of the thesis. Preparation of the thesis presentation											
Ways of assessment	Thesis											

WIP-MDL-D1-DS-07	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Diploma seminar						30			30	1	K_W01 K_W02 K_W03 K_W04	Materials engineering

											K_W05 K_W06 K_W07 K_W08 K_W09 K_U03 K_U04 K_U05 K_U08 K_U09 K_K01 K_K02	
Course content	Objectives for the diploma thesis and the authors of the thesis. General structure and content (content) of selected parts of the diploma thesis. References to literature. Correct use of the thematic literature. Principles of delivering papers (defining the nature of the audience, structure of the speech, contact with the audience, emphasizing important statements, articulation, discussion). The latest trends in materials engineering - student presentations of the state of knowledge and research results.											
Ways of assessment	Assessment of the self - presentation.											

WIP-MDL-D1-TPOP-07	Form of classes – number of hours								Total number of hours	Total number of ECTS points	Outcomes defined for whole program	Discipline(s) to which the course relates
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Technical preparation of production	30	15		15					60	4	K_W02 K_W07 K_U04 K_U05 K_K02	Materials engineering
Course content	Manufacturing processes - an introduction. Organisation of production preparation processes. Typical stages of structural production preparation. Overall work on technology preparation. Technological preparation of production. Organisational production preparation. Making models, prototypes. Types of technology documents. Production planning. Research and experimental work. Design of new and improvement of old products. Preparation of design documentation. Making prototypes. Design of new technological processes. Improvement of existing technological processes. Design of required tooling and special production equipment. Participation of technologists in start-up and mastering of new production. Ongoing maintenance of production. Development of technical normatives (labour standards, material consumption standards, etc.). Development of normatives of technical preparation of production - normatives of labour intensity of work. Labour costs. Lengthening and shortening the production cycle. Standardisation - the process of creating and applying uniform standards. Prepare construction documentation of the selected product. Prepare technological documentation of the selected product. Preparation of normatives of material consumption. Preparation of normatives of live work. Develop normatives of material consumption. Design of technological equipment. Production implementation.											

Ways of assessment	Final test of the lecture and classes, project preparation for credit.											
WIP-MDL-D1-MR-07	**Form of classes – number of hours**								**Total number of hours**	**TotalnumberofECTSpoints**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Materials recycling	15	30							45	2	K_W01 K_W03 K_W08 K_U03 K_U09 K_K01	Materials engineering
Course content	The concepts of waste, secondary raw material and recycling. Recycling and minimization of stored solid waste and energy saving. Economic conditions for recycling. Impact on the natural environment. Classification of metallic waste and multi-material waste. The role and place of metal recycling in the raw material management system. Circular economy. Equipment used in recycling. Theoretical basis of pyro and hydrometallurgical processes used in metal recycling. Recycling of steel and other iron carrier waste. Scrap classification. Equipment used in the recycling of steel waste. Recycling of production waste. Modern technologies in aluminum recycling. Recycling of waste containing critical metals. Recycling of used batteries and accumulators, tin cans, used cell phones. Problems of waste segregation on the example of municipal waste. Recycling of paper and glass. Recycling of plastics. The problems. Development of end-of-life vehicles. Alternative fuels. Methods for determining the chemical composition of waste and recycling products. Exercises based on the use of differences in the physicochemical properties of materials included in the waste. Reminder of the basic											

	chemical calculations used in recycling (percentage, process efficiency). Calculations based on chemical reactions occurring in recycling processes. Calculations used to prepare solutions of specific concentrations. Calculations related to the separation of metals from solutions (electrolysis, cementation, precipitation of sparingly soluble compounds). Analysis of data on the structure of municipal waste in cities, communes and provinces. Analysis of regulations on segregation of household waste. Modern innovative technologies reducing the amount of waste. Review of English - language magazines.											
Ways of assessment	Test.											
WIP-MDL-D1-ACPD-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Anti-corrosion protective design	15		15						30	2	K_W01 K_W03 K_W04 K_U03 K_U04 K_K01 K_K02 K_K03	Materials engineering
Course content	Design process: function, material, shape and manufacturing method. Basics of corrosion phenomena. Types of corrosion damage and their effects. Electrochemical corrosion: mechanism and prevention. Requirements for: proper design of the structure, environmental protection, corrosion protection contractor. Protective											

	properties of varnish products. Coating systems for steel structures. Influence of surface contamination on the quality of coatings. Ways of surface preparation. Anti-corrosion protection technologies. Standards related to anti-corrosion protection. Defects of paints and anti-corrosion coatings, standardisation in the assessment of degradation of coatings. Protection of steel-concrete connections. Construction of the areological system. Methods of surface preparation for protective coatings. Protective properties of varnish products. Anti-corrosion layers after various forming techniques. Examination of geometrical parameters and tribological properties of protective layers. Defects of paints and coatings, destruction of coatings. Modification of the surface of products in industrial practice.											
Ways of assessment	Final colloquium, report of classes.											
WIP-MDL-D1-IL-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
International logistics	15	15							30	2	K_W02 K_W06 K_U05 K_U07 K_U09 K_K02 K_K03	Management and quality sciences
Course content	The essence and importance of international logistics. International logistics systems. Logistics processes and activities carried out on an international scale. International logistics infrastructure. Transport rules and											

	procedures. Enterprises and institutions involved in the implementation of processes and logistics activities on an international scale. International supply chains. Intermodal transport in international logistics. Information technology in the management of international logistics. Presentation of examples of problems related to the implementation of logistics operations on a global scale - case study analysis. Working in teams - a case study on logistics processes and activities carried out on a global scale on chosen example. Presentation of students' works. Discussions about the effects, costs, possibilities of introducing an alternative solution than presented in the case studies.
Ways of assessment	Test.

WIP-MDL-D1-DOM-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Degradation of materials	30		30						60	3	K_W01 K_W04 K_U03 K_U04	Materials engineering
Course content	Durability of materials in natural and artificial environments. Factors causing degradation of materials. Types of material degradation. Classification of corrosion phenomena and destruction of materials. Types of corrosion damage and their effects. Methods of expressing the corrosion rate. Chemical corrosion of metals. Electrochemical corrosion of metallic materials. Corrosion of ceramic materials. Selected technologies to prevent corrosion degradation. Degradation by tribological wear (abrasive, abrasion, fatigue, abrasive-adhesive, adhesive, oxidation, hydrogen). Degradation by non-tribological wear (thermal, diffusion, deformation, erosive,											

	cavitation and others). Biodegradation. Physicochemical properties of solids. Determination of the corrosion rate of metallic materials in environments of various aggressiveness. Research on the degradation of materials in the biological environment. Influence of non-metallic coatings on the corrosion resistance of materials in various environments. Research on the influence of the geometrical structure of the surface of materials on their strength. Assessment of surface resistance to wear under frictional conditions. Assessment of scratch resistance. Microscopic evaluation of the type and degree of degradation of selected materials.
Ways of assessment	Final test.

WIP-MDL-D1-LISIM-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Logistic IT systems in manufacturing companies	15	30							45	2	K_W02 K_W06 K_W07 K_U04 K_U05 K_U07 K_K02	Management and quality sciences
Course content	Structural and process approach to a production enterprise. Logistics information systems. ERP class IT systems. Evolution of ERP systems. Effects and barriers to implementing ERP systems. WMS IT systems. SCM IT systems. Organization of the implementation works of logistic IT systems. Presentation of the ERP system.											

	Presentation of other IT systems supporting logistics (eg WMS, SCM, TMS, GIS). General presentation of ERP class systems supporting logistic processes, available at the Faculty of Management (SAP, Macrologic MERIT). Installation and configuration of an ERP class system, setting access rights, identifiers and passwords. General characteristics of the selected ERP system (SAP or Macrologic MERIT). Principles of creating contractors' dictionaries as well as dictionaries of materials and services. Completing data in dictionaries. Rules for creating offers and orders in the ERP system. Creation of sample offers and orders. Basics of warehouse management in the ERP system. Rules for creating delivery orders. Create a supply order. Supply in ERP systems. Acceptance of goods at the warehouse. Purchasing documents. Storage documents. Principles of order fulfillment. Issuing a sales document and a warehouse document. Basics of production logistics. Principles of creating technology for products. Creation of technology in the ERP system. Principles of creating production guides (orders). Creation of an order in the ERP system. Order of raw materials, release of raw materials for the order. Generating warehouse documents in the ERP system. Principles of creating production reports. Generating a report in the ERP system. Presentation of the capabilities of WMS class systems and other selected applications supporting logistics processes. Presentation of the capabilities of SCM class systems supporting logistic processes. Checking the correctness of the entered data.
Ways of assessment	Test.

WIP-MDL-D1-COTAW-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole program**	**Discipline(s) to which the course relates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Computerization of transport and warehouse processes	15		30						45	2	K_W01 K_W02	Management and quality sciences

											K_W05 K_W06 K_W07 K_U04 K_U05 K_U07 K_K01 K_K02	
Course content	Basic concepts: warehouse processes, transport processes, computerization of warehouse and transport processes, logistic IT system. The use of UML in modeling information systems supporting logistic management in an enterprise - a use case diagram, documentation of use cases. The use of UML in modeling information systems supporting logistic management in an enterprise - class diagram. Sectors determining the development of logistics versus IT in logistics. The use of information and telecommunications technologies in warehouse logistics. Development line of IT systems supporting logistic management in the enterprise. Logistic IT system of MRP class - Material Requirements Planning. Logistics IT system of ERP class - Enterprise Resources Planning. Warehouse Management Systems - WMS. Mobile WMS and WCS systems. The selection and implementation of technology in warehouse management on the example of a Warehouse Management System. An example of the functionality of the WMS system. Supply Chain Management systems - SCM. Electronic data interchange. GS1 Global Identification System. Directions of using cloud computing in logistics. Analysis of the current state of computerization of warehouse and transport processes in the enterprise. Analysis of transport and warehouse processes in the enterprise before the implementation of the IT system - creating flowcharts. Analysis of the possibilities of improving the functioning of warehouse and transport processes in the enterprise with the use of selected IT technologies. Designing computerization of warehouse and transport processes of the enterprise. Pre-implementation analysis - analysis of system user requirements, analysis of IT											

	infrastructure. Modeling of the IT system supporting the management of warehouse and transport processes - creating a use case diagram. Modeling of the IT system supporting the management of warehouse and transport processes - creating documentation of use cases. Modeling of the IT system supporting the management of warehouse and transport processes - creating a class diagram.											
Ways of assessment	Reports, exam - test.											
WIP-MDL-D1-EE-07	**Form of classes – number of hours**								**Total number of hours**	**TotalnumberofECTSpoints**	**Outcomes defined for whole program**	**Discipline(s) to which the courserelates**
	Lecture	Classes	Laboratory	Project	Field activities	Seminar	Internship	Others				
Engineering ethics	15					15			30	2	K_W01 K_W06 K_W07 K_W08 K_U04 K_U07 K_K01 K_K02 K_K03 K_K04	Materials engineering
Course content	General problems of ethics and morality. Ethical foundations of business morality. The ethical dimension of economic competition. Principles of fair competition. Conflicts of values in business. Moral evaluations and decisions. Enterprise - a moral entity. Ethics in business management. Personnel management ethics.											

	International business ethics. Negotiations with foreign partners. Codes of ethics and professional standards, ethical reward and punishment. Intellectual property protection, industrial property law - inventions, patents, trademarks. Problems of ethics and morality in the modern world. Business ethics - basic values. Examples of ethical problems in business. The importance of moral values in economic activity. The ethical dimension of management in the enterprise. Ethical aspects of human resource management. Business ethics in international contacts. Engineer's code of professional ethics. Patents and copyright - what is the protection of intellectual property.												
Ways of assessment	Test.												
WIP-MDL-D1-COEAC-07	**Form of classes – number of hours**								**Total number of hours**	**Total number of ECTS points**	**Outcomes defined for whole Program**	**Discipline(s) to which the course relates**	
	Lecture-	Classes	Laboratory	Project -	Field activities	Seminar	Internship	Others					
Creativity of employees and creative teams	15					15			30	2	K_W07 K_U02 K_U04 K_K01 K_K02 K_K03	Management and quality sciences	
Course content	Basic concepts of creativity. Creative processes. Kinds of creativity: explorations - combinations - transformations. Factors favoring creativity and limitations of the creative process. Creative communication, persuasive communication, communication in a group. Creative thinking methods. Rules for creating creative sessions. Tools for examining creative predispositions. Self-assessment questionnaire and psychometric												

	analysis. Questionnaire of the creative attitude of employees. Organizational culture and creativity. Creativity in the workplace. Building creative teams. The role of productive and critical thinking in creativity. Associations as a source of creative thinking. Analytical and heuristic techniques. Design thinking process. The process of assessing creativity. Methods and techniques of stimulating creativity. Creativity of the organization and innovation. Creative organization model. Management and creative teams.
Ways of assessment	Test/colloquium, presentation.

Year of study: the fourth **Semester**: the seventh

Total ECTS credits (per semester): 30 **Total number of teaching hours (per semester): 375**

Prorektor ds. nauczania

Dr hab. inż. Izabela Major, prof. PCz

Signature Not Verified

Dokument podpisany przez Izabela Major;
Politechnika Częstochowska
Data: 2023.02.23 11:01:46 CET