Study Programme

The documentation has been prepared based on materials developed within the Materials Science Ma(s)ters project, using the University of Silesia in Katowice's electronic system as an example of good practice. This system provides comprehensive support for processes related to the creation, modification, and archiving of all components of the educational program, ensuring consistency and efficiency in managing educational documentation at the university-wide level.

PART A: COURSE PROGRAMME

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time
7.	ISCED code	0715
8.	Number of semesters	4
9.	Degree	Master's Degree with engineering competencies
10.	General characteristics of the field of study and the assumed concept of education	The proposed concept for the Materials Science Masters program is based on an innovative approach that places the master's thesis at the core of the educational process. Students start working on their master's project from the beginning of their studies, choosing a topic in collaboration with companies, research institutions, or university research teams where the program is conducted. This central axis ensures continuity and coherence in the educational process while allowing students to deeply engage in practical applications of their knowledge. A key element of this concept is the personalization of the educational path. The study program is characterized by flexibility, offering a wide range of elective courses. Students, supported by academic advisors, create individual study programs that best suit their interests and career goals, always considering the topic of their master's thesis. An integral part of the education process is the Research and Development (R&D) thematic block. Within this block, students participate in specialized classes and workshops covering research methodology, experiment design, data analysis, and research project management. The program is enriched with entrepreneurship elements, including courses on starting and running tech startups, intellectual property protection, and research commercialization. These additional components aim to equip students with the skills necessary to transform innovative ideas into real business ventures. An important element of the proposed educational concept is the mentoring system. The mentor acts as a guide and advisor, supporting the student's academic and professional development throughout their studies. Regular mentoring meetings, organized both for the entire group and individually as needed, provide students with valuable advice on choosing their educational path, completing their master's thesis, and planning their career. Mentors also help develop professional networks, identify internship or research opportunities, and address potential academic challenges. This model of group or individual mentoring not only supports students in achieving their educational and career goals but also promotes collaboration and exchange of experiences among program participants. Students, along with their mentors, select the most appropriate forms of documentation and presentation of their research progress. This may include regular reports, multimedia presentations, interactive online portfolios, or research blogs. The choice of documentation method is determined jointly by the student and mentor, allowing for adaptation to the project's individual needs, participant preferences, and research specifics. In this way, students learn to communicate research results and scientific activities in a manner understandable to diverse audiences, including specialists in the field. Additionally, students learn how to use these forms of documentation to potentially demonstrate the commercial potential of their research, contributing to their entrepreneurial skills development. An innovative aspect of this concept is the integration of employability skills into course subjects. Competencies such as communication, teamwork, project management, and presentation skills are systematically incorporated into the teaching program of individual subjects. For example, in selected modules, students work on group projects that not only develop their technical knowledge but also their collaboration and time management skills. Presentations of laboratory research results serve to enhance communication skills, and regular master's thesis progress reports develop technical writing abilities. The program emphasizes the development of engineering competencies through intensive laboratory and project-based classes, interdisciplinary approaches to course topics. Students have access to the latest technologies and research equipment, allowing them to

		stay current with the latest trends in the field. Preparing engineers to meet unknown future challenges is woven into the entire structure of the study program. In each course and project, students are encouraged to think forward and innovatively. During laboratory classes, they not only learn about current technologies but also discuss potential development directions. Projects conducted during classes include future scenarios, encouraging the search for solutions to global challenges. Elements of technological forecasting and trend analysis are incorporated into existing courses, and regular guest lectures from experts provide a broader perspective. The study program is closely integrated with the socio-economic environment. A key element of this integration is the Program Board, which includes representatives from academia, leading industry companies, research institutes, and industry organizations. The Board regularly analyzes and updates the study program, ensuring its alignment with the latest technological trends and industry needs. The Program Board's involvement with industry representatives, collaboration with local companies on student projects, and organization of meetings with socio-economic environment representatives ensure that education meets real market needs. Internships and placements in industry companies are an integral part of the program, allowing students to apply their knowledge in real industrial conditions. Continuous improvement of the program is ensured through the inclusion of the program in the integrated Quality Assurance System operating at the universities implementing the education program. The system includes comprehensive procedures aimed at continuously improving the quality of education. Regular surveys among students, graduates, and employers are conducted as part of the system, gathering valuable feedback from key stakeholders. An annual program review, conducted by the Program Board and external experts, allows for systematic evaluation and updating of program content.
11.	Information on the relationship between the studies and the university's strategy as well as the socio-economic needs that determine the conduct of studies and the compliance of learning outcomes with these needs	The study programme has been developed as a result of the "Materials Science Ma(s)ters - developing a new master's degree" (2021-1-PL01-KA220-HED-000035856), co-funded by the European Union. The relationship between the studies and the university's strategy as well as the socio-economic needs have been explained in Intellectual Output 1, Intellectual Output 2, and Intellectual Output 3, which constitute separate documents.
12.	Specializations	The study program is characterized by a high degree of flexibility in shaping an individual educational path. Students select courses from thematic blocks, tailoring their choices to their interests and planned career development. However, all selections require prior approval from the program director.
13.	General description of the specialization	Example educational path: ** Innovative Engineering Materials for Sustainable Development ** In recent years, there has been a growing awareness of the importance of sustainable development in the industrial sector, leading to significant shifts towards more eco-friendly and efficient solutions. This transformation requires the development and implementation of innovative technologies and materials that contribute to achieving sustainable development goals. In this context, graduates of materials engineering, specializing in innovative engineering materials, are becoming key professionals in addressing these challenges. The "Innovative Engineering Materials for Sustainable Development" educational path has been created to prepare students for this role. The path features a flexible structure that provides students with the opportunity to gain specialized knowledge while allowing for the personalization of their educational journey. Students undertake twelve thematic blocks, which provide a solid foundation in key areas of materials engineering. These blocks include: Advanced Methods of Material Characterization, Advanced Engineering Materials, R&D in Materials Engineering, Fundamental Aspects of Materials Science, Computational Methods and Their Applications in Materials Science,

		Materials Testing and Failure Analysis, Materials and Manufacturing Technologies, and Applied Materials Science. Students select courses that allow them to focus on aspects related to sustainable development. This flexibility is a key element of the program, enabling students to tailor their education to their individual interests and career goals, while maintaining consistency with the overall objectives of the program. Within the "Innovative Engineering Materials for Sustainable Development" educational path, issues related to sustainable development are not treated as a separate, isolated component of the program but are integrally incorporated into the delivery of the content of individual subjects. This approach ensures that aspects of sustainable development are linked to key areas of materials engineering, allowing students to acquire holistic knowledge and skills. Additionally, the Humanities and Social Science block enables students to understand the broader socio-cultural context in which modern industry operates. The practical dimension of the education is particularly evident in the "Practical Training" block, during which students have the opportunity to carry out a project in real industrial conditions. This experience allows them to apply the knowledge they have gained by working on specific problems related to sustainable development in an industrial environment. The culmination of the program is a research project constituting a master's thesis, where students have the opportunity to conduct in-depth research on innovative materials in the context of sustainable development. Graduates of this path possess a solid foundation of knowledge in materials engineering, complemented by a deep understanding of the principles of sustainable development. This allows them to effectively combine these two areas in practice, creating innovative material solutions that not only meet high technical standards but also address contemporary industrial challenges related to environmental protection, efficient resource use, and social responsibility.
14.	The semester from which the specializations starts	n/a
15.	Percentage of the ECTS credits for each of the scientific or artistic disciplines to which the learning outcomes are related to the total number of ECTS credits (along with the indication of the leading discipline)	*[leading discipline]* materials engineering (engineering and technology): 100%
16.	Number of ECTS credits required to achieve the qualification equivalent to the level of study	120
17.	Percentage of the ECTS credits for optional modules in relation to the total number of ECTS credits	80%
18.	Total number of ECTS credits that a student must obtain in courses requiring direct participation of academic teachers (or other instructors) and students	65

19.	Number of ECTS credits that a student must obtain in modules assigned to disciplines within the humanities or social sciences (not less than 5 ECTS) - in the case of fields of study assigned to disciplines within the fields other than, respectively, humanities or social sciences	6
20.	Number of ECTS credits - higher than 50% of the total number of credits - that a student must obtain: • in general university programmes within a module connected with research carried out in the scientific or artistic disciplines to develop his/her knowledge and research skills; • in practical programmes within a module to develop practical skills	114
21.	Total number of ECTS credits that a student must obtain in internships	10
22.	Internships (hours and conditions) in the case of practical programmes and in general university programme - if such requires internship	Internships are an integral part of the study program, carried out by students in individual fields, levels, profiles and forms of study. Internships are to help in confronting the knowledge acquired during studies with the requirements of the labour market, acquiring skills useful in the profession, learning about practical issues related to working in positions for which the student is prepared during the course of studies. The internship is to familiarize the student with professional language relevant to a specific industry and work culture. The rules for the organization of internships are set out in the Rector's ordinance. Detailed rules of apprenticeship taking into account the specifics of particular fields of study are set out in the field's of study apprenticeship regulations, in particular: learning outcomes assumed to be achieved by the student during the apprenticeship, framework apprenticeship program including a description of issues, dimension of apprenticeship (number of weeks of practice); form of internship (continuous, mid-year), criteria for choosing the place of internship, obligations of the student staying in the internship, obligations of the academic tutor, conditions for completing the internship by the student and conditions for exemption from the internship obligation in whole or in part. The number of ECTS and the number of hours are specified in the course structure.
23.	Graduation requirements	The condition for admission to the diploma examination is to achieve the learning outcomes provided for in the study program, to obtain a certificate of an appropriate level of language proficiency in a foreign language and to obtain positive grades for the diploma dissertation. The condition for graduation is to pass the diploma examination with at least a satisfactory result. A graduate receives a higher education diploma confirming obtaining the qualifications of the appropriate degree. Detailed rules of the diploma process and the requirements for the diploma thesis are set out in the Rules and Regulations of Studies at the University of Silesia and the diploma regulations.

PART B: LEARNING OUTCOMES

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

Code of the learning outcome of the programme	**Learning outcomes** The graduate:	Codes of the second-order PRK characteristics to which the learning outcome of the programme is related
KNOWLEDGE		
MSM_W01	student possesses in-depth and systematic knowledge, covering key issues as well as selected aspects of advanced specialized knowledge from various disciplines that form the theoretical foundation of materials engineering.	2018_P7S_WG
MSM_W02	has in-depth, systematic, and theoretically grounded knowledge in the field of various groups of engineering materials and is familiar with current and prospective areas of their applications.	2018_P7S_WG
MSM_W03	possesses in-depth, systematic, and theoretically grounded knowledge, covering the complex relationships between the structure and properties of engineering materials, which form the theoretical foundation necessary for shaping, manufacturing, designing, and modeling engineering materials with specific properties.	2018_P7S_WG
MSM_W04	has in-depth, systematic, and theoretically grounded knowledge in the methods and techniques used for manufacturing, shaping the form, structure, and properties of engineering materials.	2018_P7S_WG
MSM_W05	possesses in-depth, systematic, and theoretically grounded knowledge of material testing methods and the construction of scientific research equipment necessary for evaluating the structure and properties of engineering materials.	2018_P7S_WG
MSM_W06	knows and understands the complex processes occurring throughout the life cycle of devices, structures, and technical systems, with particular emphasis on the processes of degradation of engineering materials and the measures to prevent or delay these processes.	2018_P7S_WG
MSM_W07	possesses in-depth, systematic, and theoretically grounded knowledge in the methodology of selecting engineering materials, taking into account the complex relationships between their structure, properties, and operational requirements.	2018_P7S_WG
MSM_W08	possesses in-depth, systematic, and theoretically grounded knowledge of the methodology for selecting engineering materials, taking into account the complex relationships between their structure, properties, and operational requirements.	2018_P7S_WG, 2018_P7S_WK
MSM_W09	possesses systematic and theoretically grounded knowledge in the field of computer-aided engineering work and demonstrates a deep understanding of the potential applications of selected information and communication technologies, as well as software tools, in materials engineering.	2018_P7S_WG
MSM_W10	has in-depth and systematic knowledge in the field of industrial property protection, intellectual property, and copyright law.	2018_inż_P7S_WK
MSM_W11	has in-depth and systematic knowledge of the principles of creating and developing various forms of entrepreneurship related to the broadly understood field of materials engineering.	2018_P7S_WK
MSM_W12	possesses in-depth and systematic knowledge of the methodology for conducting scientific research in the field of materials engineering, including in the context of implementing research and development projects.	2018_P7S_WG, 2018_P7S_WK
OOD.2024_W01	The student has in-depth knowledge of selected scientific methods and knows problems characteristic of a particular field of science unrelated to the leading discipline of the study programme.	2018_P7S_WG, 2018_P7S_WK

SKILLS		
MSM_1U01	is able to acquire information from various sources, including scientific literature, databases and technical standards, make appropriate selection, evaluation and critical analysis of these sources, synthesize and creatively interpret the information, and then present the obtained results in a clear and understandable manner.	2018_P7S_UW
MSM_1U02	is able to formulate and test hypotheses related to simple research problems, particularly involving the shaping, manufacturing, design, modeling, and selection of engineering materials with specific properties.	2018_P7S_UW
MSM_1U03	is able to apply existing methods or develop new ones and tools to identify, formulate, and solve research problems and engineering tasks, critically assessing their usefulness and effectiveness under conditions of incomplete predictability.	2018_P7S_UW, 2018_inż_P7S_UW
MSM_1U04	is able to select and use information and communication technologies as well as computer methods and tools to formulate and carry out tasks, including engineering tasks.	2018_P7S_UW, 2018_inż_P7S_UW
MSM_1U05	is able to design a simple device, object, system, or process typical for materials engineering, according to a given specification, using appropriate methods, techniques, and design tools.	2018_P7S_UW, 2018_inż_P7S_UW
MSM_1U06	is able, when formulating and solving tasks, including engineering tasks, to conduct a preliminary economic analysis and critically assess non-technical aspects, including in the context of global civilizational challenges.	2018_P7S_UW, 2018_inż_P7S_UW
MSM_1U07	is able to communicate with various audiences using appropriately tailored specialist terminology, including conducting discussions and debates, presenting and analyzing various aspects of materials engineering.	2018_P7S_UK
MSM_1U08	is able to develop documentation related to task execution, including tasks of an engineering nature, and present the results using appropriate methods and tools.	2018_P7S_UK
MSM_1U09	is able to work individually as well as collaborate in teams, including taking on the role of a leader directing the team's work.	2018_P7S_UO
MSM_1U10	is able to independently plan and implement the process of lifelong learning, as well as guide and support others in this area.	2018_P7S_UU
OOD.2024_U01	The student has advanced skills to set scientific questions and analyse problems or to solve problems practically on the basis of the course content, experience and skills gained in a particular field of science unrelated to the leading discipline of the study programme.	2018_P7S_UW
SOCIAL COMPETENCES		
MSM_2K01	demonstrates the ability to critically assess acquired knowledge and received content, recognizes the role of knowledge in solving complex cognitive and practical problems, and is willing to seek expert opinions when encountering difficulties in solving a problem independently.	2018_P7S_KK
MSM_2K02	is ready to actively engage in raising public awareness about the role and importance of materials engineering, promoting its achievements, and initiating actions for the public interest in this field.	2018_P7S_KO
MSM_2K03	is ready to professionally fulfill professional roles, demonstrating responsibility towards assigned duties, acting in accordance with ethical principles and professional standards.	2018_P7S_KR
MSM_2K04	is ready for entrepreneurial and innovative thinking and action in the field of materials engineering, actively seeking new solutions, including in the context of the challenges and dilemmas of modern civilization.	2018_P7S_KO
OOD.2024_KS01	The student has in-depth knowledge of selected scientific methods and knows problems characteristic of a particular field of science unrelated to the leading discipline of the study programme.	2018_P7S_KK

PART C: COURSE STRUCTURE

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time
7.	Academic year for which the revised course structure applies	n/a

A

No.	Module	Lang.	E/C	form of teaching: Total		form of teaching: O	Total ECTS	year 1 / semester 1: L	O	E	year 1 / semester 2: L	O	E	year 2 / semester 3: L	O	E	year 2 / semester 4: L	O	E
1	Advanced Engineering Materials	EN	E	160		160	12		160	12									
2	Advanced Methods for Materials Characterisation	EN	E	120		120	8		120	8									
3	Fundamental Aspects of Materials Science	EN	C	60		60	4		60	4									
4	Research & Development in Material Science and Engineering - part 1	EN	C	75		75	6		75	6									
5	Computational Methods and their Applications in Materials Engineering	EN	E	90		90	6					90	6						
6	Materials & Manufacturing	EN	E	180		180	12					180	12						
7	Materials Testing Methods and Failure Analysis	EN	E	135		135	12					135	12						
8	Applied Materials Science & Engineering	EN	E	180		180	12								180	12			
9	Path Related Project - PBL or Professional practice	EN	C	120		120	10								120	10			
10	Research & Development in Material Science and Engineering part 2	EN	C	60		60	8								60	8			
11	General academic module (Humanities)	EN	C	30		30	3											30	3
12	General academic module (Social Sciences)	EN	C	30		30	3											30	3
13	Research Project - Master Thesis	EN	E	170		170	24											170	24
	TOTAL A:			**1410**		**1410**	**120**	**0**	**415**	**30**	**0**	**405**	**30**	**0**	**360**	**30**	**0**	**230**	**30**
	TOTAL:			**1410**		**1410**	**120**	**415**		**30**	**405**		**30**	**360**		**30**	**230**		**30**
TOTAL EXCLUDING INTERNSHIPS								**1290**											
TOTAL								**1410**											

The study ends with the awarding of a Master's Degree with engineering competencies in the field of Materials Science and Engineering

Legend
Each semester consists of 15 weeks
E/C - exam/course work
E - ECTS
O - all forms of teaching (practical classes, laboratory classes, discussion classes, seminar, proseminar, language classes, field practice, workshop, internship, tutoring)

PART D: Thematic Block Description

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Advanced Engineering Materials**
Thematic Block Code	IM2A_AEM
Number of the ECTS credits	12
Language of instruction	English
Purpose and description of the content of education	The "Advanced Engineering Materials" module is a comprehensive set of thematic blocks designed to deepen students' knowledge of contemporary engineering materials. The module covers a wide spectrum of engineering materials, including composites, ceramics, functional polymers, advanced metal alloys, and modern materials such as metamaterials and nanostructures. The modular architecture of the module enables the optimization of the educational path, tailored to the individual research preferences and professional aspirations of the students. Each thematic block provides a solid foundation in materials science. Building on these fundamentals, students will explore advanced aspects of engineering materials, including their characteristics, applications, and innovative production and processing methods. The program integrates the latest achievements in science and technology with a practical approach, allowing students to explore the latest trends and technologies in the field of engineering materials. The aim is to prepare students for effective functioning in professional and scientific environments, both domestically and abroad. The program places a strong emphasis on sustainable development. Students will delve into materials and technologies that reduce negative environmental impact, promoting eco-friendly and sustainable engineering solutions. The module program also takes into account ecological, economic, and social aspects, preparing students to develop innovative solutions that support sustainable development. The program assumes the development of communication skills that are essential for effectively presenting research results, writing scientific and technical reports, and communicating with other specialists in the field. The module program not only conveys current knowledge but also inspires thinking about future trends in the field of engineering materials. With an emphasis on innovation, students are prepared to actively shape the future of this discipline and to flexibly respond to rapidly evolving technological requirements.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
AEM_0W01	The student possesses systematic and theoretically grounded knowledge regarding selected groups of advanced engineering materials and is familiar with current trends and prospective directions of development in the field of their applications.	MSM_W02	3

AEM_0W02	The student possesses advanced theoretical knowledge necessary for the shaping, manufacturing, designing, and modeling of engineering materials with specific properties, based on a deep understanding of the relationship between the structure and properties of these materials.	MSM_W01 MSM_W03 MSM_W09	1 3 3
AEM_0W03	The student understands the importance of developing advanced engineering materials in the context of sustainable development, taking into account their impact on the natural environment, economic growth, and social well-being.	MSM_W08	3
AEM_1U01	The student is able to analyze and assess the properties of various groups of advanced engineering materials and identify potential areas of their applications.	MSM_1U01 MSM_1U03	3 3
AEM_1U02	The student is capable of formulating and solving selected problems, particularly those involving the shaping, manufacturing, and selection of advanced engineering materials with specific properties.	MSM_1U02 MSM_1U03 MSM_1U06	3 3 3
AEM_1U03	The student is able to apply information and communication technologies (ICT) to solve research or engineering problems in the field of advanced materials, selecting appropriate tools depending on the nature of the task.	MSM_1U04	3
AEM_1U04	The student is able to effectively communicate on topics related to advanced engineering materials, including presenting research findings and engaging in discussions with specialists in this field.	MSM_1U07 MSM_1U08	3 3
AEM_1U05	The student is capable of leading a research team working on advanced engineering materials, as well as collaborating with others in team-based projects.	MSM_1U09	3
AEM_1U06	The student is capable of independently planning and pursuing lifelong learning in the field of advanced engineering materials, as well as guiding others in this area, taking into account the rapidly changing state of knowledge and technology in this domain.	MSM_1U10	3
AEM_2K01	The student is prepared to critically evaluate their knowledge in the field of advanced engineering materials and to recognize the importance of knowledge in solving cognitive and practical problems in this area.	MSM_2K01	3
AEM_2K02	The student is prepared to think and act in an entrepreneurial and innovative manner, seeking new solutions in the field of engineering materials, with consideration for aspects of sustainable development.	MSM_2K04	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*

b04	Problem-solving methods	Activating method – discussion / debate
		an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e06	Practical methods	Observation *also conducted as fieldwork; a method of watching phenomena, objects or people in a systematic/planned way in order to gain knowledge about them; perceptual separation of elements of a model action as an element of learning through imitation; a complex system of cognition based on sensory experiences*

e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
AEM_opt_N	depending on the choice	160	exam	AEM_0W01, AEM_0W02, AEM_0W03, AEM_1U01, AEM_1U02, AEM_1U03, AEM_1U04, AEM_1U05, AEM_1U06, AEM_2K01, AEM_2K02	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e06, e07, e08, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Advanced Methods for Materials Characterisation**
Thematic Block Code	IM2A_AMMC
Number of the ECTS credits	8
Language of instruction	English
Purpose and description of the content of education	The module is a fundamental component of the master's program, offering an advanced and comprehensive approach to material characterization. The program is designed to provide students with both in-depth theoretical knowledge and practical skills necessary for conducting material research at an expert level. The module is structured in blocks, allowing students to personalize their educational path by selecting components that align with their scientific interests and career aspirations. Each block includes a thorough analysis of the physical principles, application methodologies, and limitations of various characterization techniques, ensuring a solid understanding of both theoretical foundations and practical aspects. An integral part of the program is the synthesis of academic lectures with intensive laboratory sessions, enabling students to directly apply the theoretical knowledge they acquire in practice. The hands-on activities are conducted using advanced research equipment, helping students develop the technical competencies required in modern research and industrial laboratories.The program places a particular emphasis on developing analytical and critical thinking skills. Students are trained to assess the appropriateness of different characterization methods concerning specific materials and research contexts, a critical skill for making strategic decisions in both academic and industrial environments.The module covers a wide range of topics, ensuring comprehensive preparation and making graduates versatile specialists in the field of material characterization. Upon completing the block, students acquire a set of highly specialized competencies that are highly valued in both academic and industrial sectors. Graduates are well-prepared to tackle complex research challenges, participate in innovative scientific projects, and function effectively in a dynamic professional environment. The program not only presents the current state of knowledge but also stimulates reflection on future directions in the field of material characterization. This innovation-oriented perspective prepares students to actively contribute to shaping the future of the discipline and to adapt to rapidly changing technological demands.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
AMMC_0W01	The student possesses in-depth and structured knowledge of the principles of operation and applications of selected research methods and specialized scientific equipment used for identifying and describing the structure of materials and studying their properties.	MSM_W05	3
AMMC_0W02	The student is familiar with and understands current trends in the development of research techniques for the characterization of material structure and properties, and is able to assess their potential applications.	MSM_W08 MSM_W09	2 3

AMMC_0W03	The student analyzes and evaluates the adequacy of various characterization methods in relation to specific materials and research contexts.	MSM_W07	3
AMMC_0W04	The student has in-depth knowledge of the methodology of conducting scientific research in the field of material characterization.	MSM_W12	3
AMMC_0W05	The student is familiar with and understands the economic, legal, and other conditions related to various types of activities in material characterization, including the principles of industrial property protection and copyright law.	MSM_W10	3
AMMC_0W06	The student identifies current trends in the development of research techniques for characterizing material structure and properties and assesses their potential applications.	MSM_W08 MSM_W09	3 3
AMMC_1U01	The student is able to select and apply appropriate characterization methods in relation to specific materials and research contexts.	MSM_1U02 MSM_1U03 MSM_1U04	3 3 3
AMMC_1U02	The student is capable of critically analyzing and evaluating existing technical solutions and proposing improvements in the field of material characterization.	MSM_1U03 MSM_1U04	3 3
AMMC_1U03	The student is able to communicate on specialized topics in the field of material characterization with diverse audiences.	MSM_1U07	3
AMMC_1U04	The student is able to collaborate with others in team projects and take a leading role in teams conducting material research using advanced characterization techniques.	MSM_1U09	3
AMMC_2K01	The student is prepared to critically assess their knowledge and the information received in the field of material characterization, as well as to recognize the importance of knowledge in solving cognitive and practical problems.	MSM_2K01	3
AMMC_2K02	The student is ready to initiate actions in the public interest, think and act entrepreneurially in the implementation of innovative material characterization techniques, including in the context of achieving sustainable development goals.	MSM_2K04	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and*

		turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the*

		method of practical classes is dominated by the application of knowledge to solving practical tasks
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
AMMC_opt_N	depending on the choice	120	exam	AMMC_0W01, AMMC_0W02, AMMC_0W03, AMMC_0W04, AMMC_0W05, AMMC_0W06, AMMC_1U01, AMMC_1U02, AMMC_1U03, AMMC_1U04, AMMC_2K01, AMMC_2K02	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes

d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Applied Materials Science & Engineering**
Thematic Block Code	IM2A_AMSE
Number of the ECTS credits	12
Language of instruction	English
Purpose and description of the content of education	The thematic block "Applied Materials Engineering" aims to comprehensively prepare students for the effective utilization and implementation of advanced engineering materials in an industrial context. The program combines advanced theoretical knowledge with practical engineering skills, enabling students to understand and solve complex challenges related to the deployment of innovative materials across various sectors of the economy. Students will explore the latest advancements in materials engineering, gaining insights into the properties, synthesis methods, and potential applications of advanced materials. They will become familiar with techniques for designing, characterizing, and optimizing materials for specific industrial applications. Depending on their chosen specialization track, students will investigate the potential of innovative materials to address diverse global challenges, such as energy storage and water purification. This personalized approach allows students to gain a deeper understanding of specific challenges and opportunities in their chosen field while maintaining a strong foundation in general materials engineering knowledge. The program also places significant emphasis on developing a critical perspective on material innovations. Students learn to evaluate not only the potential benefits but also the long-term consequences and potential risks associated with the implementation of new materials. This critical perspective includes life cycle analysis of products, environmental impact assessments, ethical considerations, and the social implications of using advanced materials. As a result, graduates will be equipped to make informed and responsible decisions, taking into account the broader technological, environmental, and societal context. By combining advanced theory with practical projects and case studies, the "Applied Materials Engineering" block equips students with the comprehensive skills necessary to design, implement, and optimize innovative material solutions in modern industry. Students will be prepared to tackle complex engineering challenges, merging innovation with practical application in the evolving world of materials technology.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
AMSE_0W01	The student understands the relationships between the structure and properties of engineering materials and can explain their significance in the context of material optimization and selection for various industrial applications.	MSM_W02 MSM_W03	3 3
AMSE_0W02	The student is familiar with and understands the key challenges and limitations associated with the implementation of	MSM_W08	3

	innovative materials in specific applications, including technological, economic, and environmental aspects.		
AMSE_0W03	The student understands the complex relationships between the selection of engineering materials and their functionality, durability, and environmental impact throughout the product life cycle.	MSM_W06 MSM_W07	3 3
AMSE_0W04	The student has advanced knowledge of developmental trends and new achievements in the field of applied engineering materials and their potential impact on addressing global civilizational challenges.	MSM_W08 MSM_W09	3 3
AMSE_1U01	The student is able to solve complex engineering problems related to the selection and application of engineering materials, taking into account their properties, operating conditions, as well as economic and environmental aspects.	MSM_1U01 MSM_1U02 MSM_1U03 MSM_1U08	3 3 3 3
AMSE_1U02	The student is capable of designing and conducting complex experiments or computer simulations related to the study of engineering material properties, as well as critically analyzing and interpreting the obtained results in the context of specific applications.	MSM_1U03 MSM_1U04	3 3
AMSE_1U03	The student is able to communicate with specialists from various fields to effectively implement innovative materials in industrial practice, as well as present and justify their decisions.	MSM_1U07	3
AMSE_1U04	The student is able to explain complex issues related to the use of engineering materials in industry to different groups of audiences and relate them to civilizational dilemmas.	MSM_1U07 MSM_1U08 MSM_2K02	3 3 3
AMSE_1U05	The student is able to plan and collaborate in a team on engineering projects related to the selection and application of innovative materials, assuming various roles within the team and demonstrating entrepreneurial skills.	MSM_1U09	3
AMSE_2K01	Student demonstrates the ability to objectively assess his own knowledge in the field of engineering materials application, is open to new information, and is willing to consult with experts to solve complex problems in this area.	MSM_2K01	3
AMSE_2K02	Student is aware of his social role and actively engages in activities promoting innovative material solutions, striving to make a positive impact on the environment and society.	MSM_2K03	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution*

		to the issues presented in the lecture as well as the indication of the consequences of the proposed solution
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so*

		that its participant can acquire an experience close to the authentic one; work on "replacement" material
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
AMSE_opt_N	depending on the choice	180	exam	AMSE_0W01, AMSE_0W02, AMSE_0W03, AMSE_0W04, AMSE_1U01, AMSE_1U02, AMSE_1U03, AMSE_1U04, AMSE_1U05, AMSE_2K01, AMSE_2K02	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	Yes
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion	Yes
		a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course	
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Computational Methods and their Applications in Materials Engineering**
Thematic Block Code	IM2A_CMAME
Number of the ECTS credits	6
Language of instruction	English
Purpose and description of the content of education	The thematic block "Computational Methods and Their Applications in Materials Science" aims to comprehensively prepare students for the effective use of modern information and communication technologies, as well as advanced computer methods and techniques, including computer-aided design and engineering, in research work and their future professional careers. The block focuses on four key aspects: introducing students to basic and advanced computational methods used in materials science, developing practical skills in the use of tools and software for computer simulations, applying computational techniques to solve real engineering problems, and promoting an interdisciplinary approach to research and the development of innovative materials by integrating theoretical, experimental, and computational methods. The flexible, modular structure of the block allows for the individual customization of the learning path to suit the student's personal research interests and career plans. The skills acquired will enable students to effectively utilize computational and IT tools to optimize processes in the design, production, and testing of materials. The program emphasizes building an understanding of the key role advanced computational methods and computer simulations play in the creation of new materials and the improvement of technological processes. This awareness will allow them to recognize the significance of their work in the context of global trends and challenges faced by the materials industry, while also motivating them to continuously develop their skills and seek innovative solutions. The program places a strong emphasis on the practical application of the knowledge gained, ensuring that students are well-prepared to work in both modern research laboratories and the rapidly evolving industry, where skills related to computer modeling and simulation are increasingly in demand. The thematic block "Computational Methods and Their Applications in Materials Science" aims to educate a new generation of engineers who will be able to meet the challenges posed by rapidly evolving technologies and the growing demands of the job market.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
CMAME _0W01	The student possesses advanced knowledge of modern information and communication technologies, as well as advanced computational methods and techniques used in materials engineering.	MSM_W09	3
CMAME _0W02	The student has structured and theoretically grounded knowledge in the interdisciplinary approach to materials research, integrating theoretical, experimental, and computational methods.	MSM_W12	3
CMAME	The student understands the key role of advanced computational methods and computer simulations in the development	MSM_W08	3

_0W03	of new materials and the improvement of technological processes in the context of global trends and industrial challenges.		
CMAME_1U01	The student is able to effectively utilize modern information and communication technologies, as well as advanced computer methods and techniques, to solve real engineering problems in the field of materials engineering.	MSM_1U03 MSM_1U04	3 3
CMAME_1U02	The student is able to integrate knowledge from various fields and apply an interdisciplinary approach to the research and development of innovative materials, combining theoretical, experimental, and computational methods.	MSM_1U01 MSM_1U02 MSM_1U03 MSM_1U04	3 3 3 3
CMAME_1U03	The student is able to independently plan and pursue the continuous development of their skills in computational methods, taking into account rapidly evolving technologies and the increasing demands of the job market.	MSM_1U10	3
CMAME_2K01	The student is prepared to critically evaluate their knowledge and skills in the area of computational methods used in materials science and to continuously seek innovative solutions.	MSM_1U01 MSM_2K01	3 3
CMAME_2K02	The student is prepared to take on professional challenges in modern research laboratories and the rapidly developing industry, utilizing skills related to computer modeling and simulation.	MSM_2K03	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative*

		analysis and evaluation of a selected phenomenon
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10.	Forms of teaching				
Code	**Name**	**Number of hours**	**Assessment of the Learning Outcomes of the Thematic Block**	**Learning Outcomes of the Thematic Block**	**Methods of conducting classes**
CMAME_opt_N	depending on the choice	90	exam	CMAME_0W01, CMAME_0W02, CMAME_0W03, CMAME_1U01, CMAME_1U02, CMAME_1U03, CMAME_2K01, CMAME_2K02	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f02

11.	The student's work, apart from participation in classes, includes in particular:		
Code	**Category**	**Name (description)**	**Is it part of the BUNA?**
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	No
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	Field of study	Materials Science Ma(s)ters
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General Information about the Thematic Block
Thematic Block Name	**Fundamental Aspects of Materials Science**
Thematic Block Code	IM2A_FAMS
Number of the ECTS credits	4
Language of instruction	English
Purpose and description of the content of education	The thematic block "Fundamental Aspects of Materials Science" focuses on deepening students' knowledge in the broadly defined field of materials science. It consists of thematic modules that students can choose from, allowing them to personalize their learning path. Each module is designed to achieve learning outcomes that integrate knowledge from other disciplines, particularly mathematics, physics, and chemistry, providing a solid foundation necessary to understand the complex processes and phenomena occurring in materials. As a result, students are prepared to identify, formulate, and propose solutions to selected engineering problems using an interdisciplinary approach. The block not only deepens the theoretical foundations of materials engineering but also places significant emphasis on the practical application of the acquired knowledge. Students will gain practical skills such as developing problem-solving strategies, preparing workstations, executing assigned tasks, and preparing documentation related to their implementation.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
FAMS_0W01	The student has an in-depth understanding of the theoretical foundations of materials science, integrating knowledge from mathematics, physics, and chemistry.	MSM_W01	3
FAMS_0W02	The student knows and understands the complex processes and phenomena occurring in materials and is able to analyze and interpret them using an interdisciplinary approach.	MSM_W01 MSM_W03	3 3
FAMS_1U01	The student is able to integrate knowledge from various scientific disciplines to identify, formulate, and solve complex engineering problems in the field of materials science.	MSM_1U01 MSM_1U03	3 3
FAMS_1U02	The student is able to develop a theoretically justified strategy for solving a problem in the field of materials engineering, utilizing an interdisciplinary approach.	MSM_1U01 MSM_1U02	3 3
FAMS_1U03	The student is able to plan and conduct advanced research or experiments related to material analysis, interpret the obtained results, and draw conclusions.	MSM_1U03 MSM_1U08	3 3

FAMS_1U05	The student is capable of independently planning and pursuing lifelong learning, particularly in the context of the rapidly evolving field of materials science.	MSM_1U01 MSM_1U10	3 3
FAMS_2K01	The student is prepared to critically evaluate their knowledge and the information they receive in the field of materials science, recognizing the importance of knowledge in solving cognitive and practical problems.	MSM_2K01	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer

		e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10.	Forms of teaching				
Code	**Name**	**Number of hours**	**Assessment of the Learning Outcomes of the Thematic Block**	**Learning Outcomes of the Thematic Block**	**Methods of conducting classes**
FAMS_opt_N	workshop	60	course work	FAMS_0W01, FAMS_0W02, FAMS_1U01, FAMS_1U02, FAMS_1U03, FAMS_1U05, FAMS_2K01	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f01, f02

11.	The student's work, apart from participation in classes, includes in particular:		
Code	**Category**	**Name (description)**	**Is it part of the BUNA?**
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	No
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**General academic module (Humanities)**
Thematic Block Code	OOD_2024_SS_MOH
Number of the ECTS credits	3
Language of instruction	English
Purpose and description of the content of education	The humanistic general academic module allows the student to get acquainted with selected areas of the subject-related specificity of humanities. The student has a chance to compare different methodological and interpretative approaches, and gains knowledge about the benefits of adopting a humanistic perspective of the view of reality. The student learns to implement recognized paradigms of humanistic thinking into their scientific activity, creatively solving the problems posed during the classes. Based on specific cases, the student trains the ability to integrate views appropriate for humanities with the points of view that belong to the fields of science and scientific disciplines appropriate for the studied programme. During the meetings, the student identifies manners of participation in present and future cultural formations, recognizing the paths of individual participation in the life of adequate human communities in the presented and experienced activities.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
HMO1_1	The student knows selected issues related to the subject-related specificity of the humanities, understands their nature, place and importance in the system of sciences, as well as their connections with fields of science and scientific disciplines specific to the studied programme, allowing for the integration of perspectives appropriate for different scientific disciplines..	OOD.2024_U01 OOD.2024_W01	3 3
HMO1_2	The student is able to select, interpret and evaluate knowledge from selected disciplines in the field of humanities and integrate and apply it in scientific activity and professional practice in a manner that allows for original and creative solutions to problems that they experience as participants in cultural life.	OOD.2024_U01 OOD.2024_W01	3 3
HMO1_3	The student is able to creatively undertake, analyse and become involved in current sociocultural discourses, using knowledge of the studied problems of contemporary humanities and acquired communication skills as well as subject-related argumentation that considers various scientific approaches and types of scientific reflection.	OOD.2024_U01 OOD.2024_W01	3 3
HMO1_4	The student, who is a participant in cultural life in its various manifestations, shows the need for continuous learning and improvement of those dispositions that allow to appreciate humanistic reflection and integrate it with issues and experiences resulting from choosing one's own path of scientific and professional activities and related to individual cultural activity.	OOD.2024_KS01 OOD.2024_U01 OOD.2024_W01	2 2 2

9.	Methods of conducting classes	
Code	**Category**	**Name (description)**
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10.	Forms of teaching				
Code	**Name**	**Number of hours**	**Assessment of the Learning Outcomes of the Thematic Block**	**Learning Outcomes of the Thematic Block**	**Methods of conducting classes**
01	depending on the choice	30	course work	HMO1_1, HMO1_2, HMO1_3, HMO1_4	a03, a05, b04, c07, d03, f01, f02

11.	The student's work, apart from participation in classes, includes in particular:		
Code	**Category**	**Name (description)**	**Is it part of the BUNA?**
a01	Preparation for classes	Search for materials and review activities necessary for class participation	No

		reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes	
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
e01	Activities complementary to the classes	Undertaking, on one's own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University *a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	Field of study	Materials Science Ma(s)ters
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General Information about the Thematic Block
Thematic Block Name	**General academic module (Social Sciences)**
Thematic Block Code	OOD_2024_SS_MOS
Number of the ECTS credits	3
Language of instruction	English
Purpose and description of the content of education	The social general academic module allows the student to get acquainted with selected areas of the subject-related specificity of social sciences. The student has a chance to compare different methodological and interpretative approaches, gains knowledge about the benefits of adopting a perspective of reality appropriate for social sciences. Based on specific cases, the student trains the ability to integrate views appropriate for social sciences with points of view that belong to fields of science and scientific disciplines appropriate for the studied programme.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
SMO1_1	The student knows selected issues related to the subject-related specificity of social sciences, understands their nature, place and importance in the system of sciences, as well as their connections with fields of science and scientific disciplines specific to the studied programme, allowing for the integration of perspectives appropriate for different scientific disciplines.	OOD.2024_U01 OOD.2024_W01	3 3
SMO1_2	The student is able to select, interpret and evaluate knowledge from selected disciplines in the field of social sciences and integrate and apply it in scientific activity and professional practice in a manner that allows for original and creative solutions to problems that they experience as participants in social life.	OOD.2024_U01 OOD.2024_W01	3 3
SMO1_3	The student is able to creatively undertake, analyse and become involved in current sociocultural discourses, using knowledge of the studied content, acquired communication skills and subject-related argumentation taking into account various scientific approaches and types of scientific reflection.	OOD.2024_U01 OOD.2024_W01	3 3
SMO1_4	The student, who is a participant in social life in its various manifestations, shows the need for continuous learning and improvement of those dispositions that result from choosing their own path of scientific and professional activities and related to individual social activity.	OOD.2024_KS01 OOD.2024_U01 OOD.2024_W01	2 2 2

9.	Methods of conducting classes	
Code	**Category**	**Name (description)**
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10.	Forms of teaching				
Code	**Name**	**Number of hours**	**Assessment of the Learning Outcomes of the Thematic Block**	**Learning Outcomes of the Thematic Block**	**Methods of conducting classes**
01	depending on the choice	30	course work	SMO1_1, SMO1_2, SMO1_3, SMO1_4	a03, a05, b04, c07, d03, f01, f02

11.	The student's work, apart from participation in classes, includes in particular:		
Code	**Category**	**Name (description)**	**Is it part of the BUNA?**

a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
e01	Activities complementary to the classes	Undertaking, on one's own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University *a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Materials & Manufacturing**
Thematic Block Code	IM2A_M&M
Number of the ECTS credits	12
Language of instruction	English
Purpose and description of the content of education	The thematic block "Materials and Manufacturing Technologies" offers students the opportunity to select subjects related to advanced manufacturing and material processing techniques. Individual subject selection allows students to personalize their educational path according to their own interests. Students will gain knowledge about the properties and applications of various material groups, such as metals, ceramics, polymers, and composites, as well as the latest trends in their manufacturing technologies, such as 3D printing, powder metallurgy, sintering technologies, and casting. This flexibility allows students to deepen their knowledge and skills in selected areas while ensuring exposure to a broad spectrum of material and manufacturing technology topics. Within this thematic block, students will develop the ability to select appropriate materials and manufacturing processes for specific applications, as well as the capacity to analyze and optimize manufacturing processes in terms of quality, efficiency, and cost. They will be able to effectively communicate with engineers from various fields within interdisciplinary teams. Additionally, students will acquire the ability to critically analyze and interpret experimental data. With the skills they acquire, students will be able to approach manufacturing technologies from multiple perspectives, considering technological, material, economic, environmental, and social aspects. This multifaceted approach will allow them to thoroughly understand and analyze production processes. One key element of this approach is the development of ecological awareness in the context of material and manufacturing process selection. Students will learn to analyze and assess the environmental impact of different materials and production technologies, taking into account the entire product lifecycle, from raw material extraction through processing to waste disposal. The knowledge gained will enable them to make informed and responsible decisions that contribute to minimizing the negative impact on the environment. As a result, students will be better prepared to implement and promote sustainable development practices in various industrial sectors and other areas of the economy. They will be able to identify areas where changes can be made to introduce more eco-friendly solutions and propose innovative production methods that are environmentally friendly. Students will be ready to take responsibility for projects and decisions related to material selection and manufacturing processes, as well as adapt to changing market demands and new industry trends.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
MM_0W01	The student possesses in-depth knowledge of advanced techniques for manufacturing and processing materials, including the latest technological trends in the chosen area of specialization.	MSM_W03	3

		MSM_W04	3
MM_0W02	The student possesses extensive knowledge of the properties and applications of various groups of materials (metals, ceramics, polymers, composites) in the context of modern manufacturing technologies.	MSM_W02	3
MM_0W03	The student understands the complex relationships between the selection of materials and manufacturing technologies and the economic, environmental, and social aspects throughout the product's entire life cycle.	MSM_W07	3
MM_1U01	The student is able to perform advanced analysis and optimization of manufacturing processes in terms of quality, efficiency, and costs, taking into account technological and material aspects.	MSM_1U03 MSM_1U05	3 3
MM_1U02	The student is able to communicate and collaborate effectively in interdisciplinary teams, combining specialized knowledge in manufacturing technology with expertise from other areas of science and engineering.	MSM_1U07	3
MM_1U03	The student is able to critically analyze and interpret experimental data related to manufacturing processes and material properties, formulating conclusions and recommendations based on them.	MSM_1U06 MSM_1U08	3 3
MM_2K01	The student is prepared to plan and execute complex projects related to material selection and manufacturing technologies, taking into account technical, economic, and environmental aspects.	MSM_1U05 MSM_1U06	3 3
MM_2K02	The student is prepared to initiate and implement sustainable development practices in the field of manufacturing technologies, promoting environmentally friendly solutions.	MSM_2K02	3
MM_2K03	The student is prepared to make responsible professional decisions related to the selection of materials and manufacturing processes, taking into account their impact on society and the environment.	MSM_2K03	3
MM_2K04	The student is prepared to continuously monitor and adapt to new trends in manufacturing technologies, critically assessing their potential and limitations.	MSM_2K01	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree,*

		conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*

f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
MM_opt_N	depending on the choice	180	exam	MM_0W01, MM_0W02, MM_0W03, MM_1U01, MM_1U02, MM_1U03, MM_2K01, MM_2K02, MM_2K03, MM_2K04	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f01, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	No
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes

d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Materials Testing Methods and Failure Analysis**
Thematic Block Code	IM2A_MTMFA
Number of the ECTS credits	12
Language of instruction	English
Purpose and description of the content of education	The thematic block " Materials Testing Methods and Failure Analysis " offers students an innovative and comprehensive approach to understanding and optimizing the life cycle of engineering materials, with a focus on their durability and environmental impact. The program combines advanced theoretical knowledge with practical skills, preparing students to address complex issues related to the reliability and degradation of materials in various applications. Depending on the selected modules, students can specialize in specific areas such as the degradation of different types of materials and deepen their expertise in chosen research techniques. The interdisciplinary approach allows students to understand the complex relationships between the structure, properties, and functionality of materials, as well as their behavior under operational conditions. Participants learn to interpret research results and use them to optimize engineering designs, predict failures, and prevent them. Additionally, they acquire skills in assessing and improving the reliability of material systems, taking into account economic and environmental aspects. Upon completing the block, graduates are well-prepared to tackle challenges in the field of materials engineering, with a particular focus on reliability analysis, life cycle assessment, and the development of sustainable technologies. The program trains specialists capable of critically evaluating and optimizing material properties, which is key to innovation across various industrial sectors and technological advancement.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
MTMFA_0W01	The student possesses advanced knowledge of engineering materials and the mechanisms of their degradation under various operating conditions.	MSM_W04 MSM_W06	3 3
MTMFA_0W02	The student understands the complex relationships between the structure, properties, and functionality of materials and their behavior under operational conditions and degradation processes.	MSM_W03	3
MTMFA_0W03	The student has in-depth knowledge of the impact of material degradation processes on the environment and the methods for assessing the life cycle of materials in the context of sustainable development.	MSM_W06 MSM_W07	3 3
MTMFA_1U01	The student is able to select and apply advanced research methods to analyze the properties and degradation of materials, interpreting the obtained results in the context of specific engineering applications.	MSM_1U03	3

		MSM_1U06	3
MTMFA_1U02	The student is able to conduct a comprehensive failure analysis of materials, identify the causes of degradation, and propose preventive and optimization solutions.	MSM_1U03 MSM_1U06	3 3
MTMFA_1U03	The student is able to effectively communicate the results of research and material degradation analysis to various groups of audiences, including specialists from other fields, using specialized terminology.	MSM_1U07 MSM_1U08	3 3
MTMFA_1U04	The student is prepared to plan and execute complex research projects related to the assessment of material durability and reliability, considering technical, economic, and environmental aspects.	MSM_1U02 MSM_1U06	3 3
MTMFA_2K01	The student is prepared to critically evaluate the results of material research and degradation analyses, and to seek expert opinions when facing difficulties in independently solving a problem.	MSM_1U01 MSM_2K01	3 3
MTMFA_2K02	The student is prepared to initiate and implement actions aimed at improving the durability and reliability of materials, taking into account their impact on the environment and society.	MSM_2K02	3
MTMFA_2K03	The student is prepared to responsibly fulfill the professional role of a materials engineer, with particular emphasis on professional ethics in the context of material research and degradation analysis.	MSM_2K03	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative*

		analysis and evaluation of a selected phenomenon
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*
e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f02	Methods of self-learning	Individual work with a text

		searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
MTMFA_opt_N	depending on the choice	135	exam	MTMFA_0W01, MTMFA_0W02, MTMFA_0W03, MTMFA_1U01, MTMFA_1U02, MTMFA_1U03, MTMFA_1U04, MTMFA_2K01, MTMFA_2K02, MTMFA_2K03	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f01, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes

d02	Consulting the results of the verification of	Development of a corrective action plan as well as supplementary/corrective tasks	Yes
	learning outcomes	*reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Path Related Project - PBL or Professional practice**
Thematic Block Code	IM2A_PP
Number of the ECTS credits	10
Language of instruction	English
Purpose and description of the content of education	Professional internships are a mandatory element of the study program, during which students have the opportunity to apply theoretical knowledge acquired in academic courses to practical industrial settings. Internships can take place in companies and institutions related to the broad field of materials engineering, such as manufacturing plants, research and development laboratories, design firms, and research centers. During internships, students participate in real-world tasks and projects that, depending on the specific nature of the internship site, may involve production technologies, materials testing, quality control, materials design, or other areas relevant to the organization. An important aspect of internships is gaining an understanding of the company's organizational culture and the principles of functioning within a business environment. Students learn to navigate the company structure, become familiar with safety procedures and industry standards. Internships also provide an excellent opportunity to develop interpersonal skills—from effective team communication to professional relationships with supervisors and clients. The internship program encourages critical thinking, technical problem analysis, and the search for innovative solutions. Students have the chance to engage in research and development work, exploring the latest trends in materials engineering and related technologies. Conducting internships in a real industrial environment also allows for a deeper understanding of professional responsibility—both from a technical and ethical perspective. Students learn the importance of intellectual property protection, confidentiality principles, and the impact of engineering decisions on the natural environment and society.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
PP_0W01	Has an organized knowledge of the organizational structure, management processes, and functioning of the company or institution where the internship is carried out.	MSM_W11	3
PP_0W02	Has in-depth knowledge of specialized materials engineering topics related to the department where the internship is conducted, covering, depending on the specifics of the internship site: production technologies, materials testing, quality control, materials design, or other areas relevant to the organization.	MSM_W02 MSM_W05	3 3
PP_0W03	Knows and understands the economic, legal, and ethical conditions of operations in the organization where the internship is conducted, including work safety regulations, intellectual property protection, and corporate confidentiality.	MSM_W10 MSM_W11	3 3

PP_1U01	Is able to apply knowledge of materials engineering in practice, solving real-world problems and carrying out engineering tasks in the department where the internship is conducted.	MSM_1U03	3
PP_1U02	Is able to critically analyze existing technical solutions used in the organization and propose improvements or innovations, taking into account technological, economic, and environmental aspects.	MSM_1U02 MSM_1U06	3 3
PP_1U03	Effectively communicates with the team, supervisors, and stakeholders, presenting the results of their work and proposed solutions in a manner understandable to audiences with varying levels of technical knowledge.	MSM_1U07 MSM_1U08	3 3
PP_1U04	Is able to plan and carry out engineering tasks individually and as part of a team, assuming various roles within the team and demonstrating adaptability to changing conditions.	MSM_1U09	3
PP_1U05	Is able to independently plan and pursue lifelong learning, including keeping up with the latest developments in materials engineering and enhancing professional competencies.	MSM_1U10	3
PP_2K01	Critically analyzes their knowledge in the context of assigned tasks and responsibilities, demonstrating a readiness to consult with experts in the field when encountering difficulties or doubts.	MSM_2K01	3
PP_2K02	Develops professional competencies by independently expanding knowledge and skills, keeping up with the latest trends in materials engineering and related fields.	MSM_2K02	3
PP_2K03	Is aware of the social responsibility associated with carrying out assigned tasks and demonstrates a readiness to initiate actions in the public interest.	MSM_2K02 MSM_2K04	3 3
PP_2K04	Adheres to professional ethics and fosters the development of their profession, taking into account changing social and technological conditions.	MSM_2K03	3

9. Methods of conducting classes

Code	Category	Name (description)
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
fs_1	internship	120	course work	PP_0W01, PP_0W02, PP_0W03, PP_1U01, PP_1U02, PP_1U03, PP_1U04, PP_1U05, PP_2K01, PP_2K02, PP_2K03, PP_2K04	e05

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No

b03	Consulting the curriculum and the organization of classes	Consulting the schedule *getting acquainted with the class schedule, possibly in the presence of the year tutor, in order to optimize participation in classes, including those supplementary to the core subjects listed in the pursued study programme*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	Yes
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes
e01	Activities complementary to the classes	Undertaking, on one's own initiative and individually, activities aimed at expanding the scope or depth of the teaching content, also beyond the walls of the University *a set of activities undertaken independently and on the student's own initiative, aimed at expanding the depth and scope of knowledge and skills, their revision and repetition, retention or verification, also activities carried outside the university, e.g., in a culture promoting or educational institution, a laboratory, in the open air, etc.; also self-education*	No
e03	Activities complementary to the classes	Participation in non-obligatory teaching, research or organizational grants intensifying the achievement of the assumed learning outcomes *research, artistic, social and other activities not indicated in the curriculum, undertaken on the student's own initiative as a way of supplementing, enriching or extending the content and activities indicated in the module curriculum, intensifying the achievement of learning outcomes*	No

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	Field of study	Materials Science Ma(s)ters
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General Information about the Thematic Block	
Thematic Block Name		**Research & Development in Material Science and Engineering - part 1**
Thematic Block Code		IM2A_R&D
Number of the ECTS credits		6
Language of instruction		English
Purpose and description of the content of education		The thematic block "Research and Development in Materials Engineering" is a key part of the master's degree program, aiming to comprehensively prepare students for conducting advanced scientific research and working in the rapidly evolving industrial sector related to materials engineering in the broadest sense. By participating in three modules from this thematic block, students acquire knowledge, skills, and social competencies aimed at strengthening their position in the competitive job market. The goal of the first module, "Introduction to Research Projects," is to familiarize students with the fundamental aspects of conducting scientific research. It covers research methodologies, experiment planning, data analysis, and the principles of writing scientific reports. Students learn to formulate research hypotheses and conduct studies in accordance with the highest standards of scientific ethics. This module serves as the foundation for further development of students' research competencies. The second module, "Industrial Visits and Lectures - Proposal of Thesis Topics from Industry," offers students a unique opportunity to directly interact with the industrial sector related to materials engineering. Through visits to companies and/or lectures given by experienced industry professionals, students gain insights into the current challenges and needs of the market. This educational experience supports the process of selecting thesis topics that address real-world industrial problems. Additionally, this module provides opportunities to establish valuable connections with potential employers and mentors. The third module, "International Teamwork and Communication in a Foreign Language," focuses on developing key soft skills essential in the globalized scientific and industrial world. Students are introduced to the methodology of working on projects carried out in collaboration with foreign academic institutions or companies, allowing them to gain valuable experience working in multicultural teams. These activities improve language skills and shape the ability to communicate and collaborate effectively in an international context.
List of Modules Available Within the Thematic Block		Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
RD_0W01	The student knows and understands the fundamental principles of planning and managing research projects in materials engineering, both in academic and industrial contexts.	MSM_W12	3
RD_0W02	The student knows and understands the structure and components of a research project, including objectives, hypotheses, methodology, timeline, and potential industrial applications.	MSM_W12	3

RD_0W03	The student knows and understands the economic, legal, and ethical conditions of research and innovation activities in materials engineering, including the principles of intellectual property protection and collaboration with industry.	MSM_W10 MSM_W11	3 3
RD_1U01	The student is able to conduct a critical analysis and select a research problem, integrating knowledge of the latest research trends and industry needs.	MSM_1U01 MSM_1U02	3 3
RD_1U02	The student is able to formulate the objective and hypotheses for a research problem, considering both scientific aspects and the needs of the industry in the field of materials engineering.	MSM_1U02	3
RD_1U03	The student is able to develop a preliminary research plan, selecting appropriate research methods and techniques, while taking into account available academic and industrial resources.	MSM_1U02 MSM_1U06	3 3
RD_1U04	The student is able to prepare and present a solution concept for a selected research problem in the form of a presentation, taking into account the potential industrial applications of the proposed solutions.	MSM_1U07 MSM_1U08	3 3
RD_1U05	The student is able to collaborate in a team on the analysis of research and industrial problems, understanding the roles of various stakeholders in the research and implementation process.	MSM_1U09 MSM_2K01	3 3
RD_1U06	The student is able to identify their own educational needs and plan a learning pathway in the context of a selected research problem and future career development.	MSM_1U10 MSM_2K01	3 3
RD_2K01	The student is prepared to critically evaluate their own research ideas and recognize the importance of expert knowledge from both academic and industrial environments in research planning.	MSM_2K01	3
RD_2K02	The student is prepared to initiate research activities aimed at solving social and technological problems in the field of materials engineering, taking into account the needs of the industry.	MSM_2K04	3
RD_2K03	The student is prepared to responsibly fulfill the role of a researcher and engineer, adhering to the principles of professional and scientific ethics in the context of collaboration with industry.	MSM_2K03	3
RD_2K04	The student is prepared to continuously update their knowledge of new methods and trends in materials engineering, both in the research and industrial aspects.	MSM_1U10	3
RD_2K05	The student is prepared to think and act in an entrepreneurial manner, identifying the commercial potential of proposed material and technological solutions within the scope of their research problems.	MSM_2K04	3

9. Methods of conducting classes

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture *a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided*
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*

b01	Problem-solving methods	Problem-based lecture *an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution to the issues presented in the lecture as well as the indication of the consequences of the proposed solution*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem*
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
e04	Practical methods	Project scheduling *proceeding according to the steps proposed within a specific methodology for the completion of a task; e.g., identifying project objectives, determining the result, identifying strengths, limitations, opportunities and threats (SWOT), establishing a schedule of activities, assessing resources, establishing an implementation plan; the initial diagnosis; the reassessment of assumptions; the process of preparing the practical implementation of a project*
e05	Practical methods	Internship *including professional and individual training; gaining skills and experience in real-life conditions, e.g., in the environment, institution or workplace the student is preparing for by following a specific study programme; training in real working conditions*

e07	Practical methods	Simulation *an indirect method; imitating reality in order to gain experience approximating a real one; recreating a real-world situation so that its participant can acquire an experience close to the authentic one; work on "replacement" material*
e08	Practical methods	Practice-as-research *also conducted as fieldwork; an activity aimed at confronting the acquired theory with practice through its practical application; students situate themselves in the reality they observe, study and transform through the prism of the theory; the method of practical classes is dominated by the application of knowledge to solving practical tasks*
f02	Methods of self-learning	Individual work with a text *searching for and acquiring new information using textbooks and other written sources (including their digital versions); searching for texts, selecting fragments for analysis/interpretation, using other texts to solve a problem related to the studied issue*

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
R&D_opt_N	depending on the choice	75	course work	RD_0W01, RD_0W02, RD_0W03, RD_1U01, RD_1U02, RD_1U03, RD_1U04, RD_1U05, RD_1U06, RD_2K01, RD_2K02, RD_2K03, RD_2K04, RD_2K05	a01, a03, a05, b01, b04, b07, c06, c07, d01, d03, e01, e04, e05, e07, e08, f02

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	No
c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	No
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	**Field of study**	**Materials Science Ma(s)ters**
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	**General Information about the Thematic Block**
Thematic Block Name	**Research & Development in Material Science and Engineering part 2**
Thematic Block Code	IM2A_R&D_2
Number of the ECTS credits	8
Language of instruction	English
Purpose and description of the content of education	The thematic block "Research & Development in Material Science and Engineering Part 2" is an advanced continuation of the first part of the module, combining specialized knowledge in materials engineering with practical business aspects. The module addresses the current demands of the job market, where an interdisciplinary approach to solving technological problems is of key importance. The program includes three main components. The first component, Testing Standards and Quality Assurance, focuses on a comprehensive approach to testing standards and quality management systems, methodologies for material certification and validation, and the implementation of advanced quality control techniques in industrial processes. Within this component, students also gain practical insights into the application of international norms and standards. The second component, Creating a Start-up, introduces students to entrepreneurship, the development of business models in the materials engineering sector, strategies for commercializing research outcomes, and the practical aspects of managing a technology start-up. The third component, Lean Manufacturing, covers the basics of Lean philosophy in the context of industries related to materials engineering, optimization of production processes, techniques for waste reduction and efficiency improvement, and the implementation of Lean tools in industrial practice.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
RD2_0W01	The student explains the methodology for assessing the innovation potential of technological solutions, including criteria and innovation indicators.	MSM_W12	3
RD2_0W02	The student describes various methods of implementing innovations, including strategies for commercializing research results, developing business models, and fundamental legal and organizational aspects related to the introduction of new technologies.	MSM_W10 MSM_W11 MSM_W12	3 3 3
RD2_0W04	The student explains the significance of international standardization systems, such as ISO, ASTM, and DIN, in conducting research and development activities in materials engineering.	MSM_W12	3
RD2_1U01	The student is able to identify and apply appropriate international norms and standards, such as ISO, ASTM, or DIN,	MSM_1U01	3

	essential for the execution of specific research and development tasks, and document this process in accordance with applicable requirements.		
RD2_1U02	The student is able to identify the innovation potential of research results and plan their practical application in industry or business.	MSM_1U06	3
RD2_1U03	The student is able to propose changes in processes that enable better resource utilization, cost reduction, and elimination of unnecessary activities, while maintaining high quality and efficiency.	MSM_1U03	3
RD2_1U04	The student is ready to collaborate in interdisciplinary teams, coordinate research and development activities, and support the transfer of technology into industrial practice.	MSM_1U09	3
RD2_2K01	The student is ready to critically evaluate their own knowledge in the face of challenges in research and development (R&D) within the field of materials engineering and is able to seek expert opinions when encountering difficulties in solving complex technological problems.	MSM_2K01	3
RD2_2K02	The student is prepared to fulfill social responsibilities by initiating and organizing research and development (R&D) activities in the field of materials engineering, taking into account the needs of the socio-economic environment.	MSM_2K02	3

9. Methods of conducting classes

Code	Category	Name (description)

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
fs_1	workshop	60	course work		

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	No
b01	Consulting the curriculum and the organization of classes	Getting acquainted with the syllabus content *reading through the syllabus and getting acquainted with its content*	No

c02	Preparation for verification of learning outcomes	Studying the literature used in and the materials produced in class *exploring the studied content, inquiring, considering, assimilating, interpreting it, or organizing knowledge obtained from the literature, documentation, instructions, scenarios, etc., used in class as well as from the notes or other materials/artifacts made in class*	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	Yes
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	No
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

1.	Field of study	Materials Science Ma(s)ters
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	n/a
4.	Level of qualifications/degree	second-cycle studies (in engineering)
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General Information about the Thematic Block
Thematic Block Name	**Research Project - Master Thesis**
Thematic Block Code	IM2A_RP-MT
Number of the ECTS credits	24
Language of instruction	English
Purpose and description of the content of education	The thematic block "Research Project - Master Thesis" is a comprehensive module that prepares students for conducting independent scientific research and writing a master's thesis. The goal of this block is to equip students with the necessary knowledge, skills, and competencies to successfully complete a research project, starting from the formulation of a research problem to the presentation and defense of the results. Within this block, students gain in-depth knowledge of research methodology, specific to the scientific field related to their thesis topic. They learn how to properly plan and conduct research, selecting appropriate methods and research tools. A crucial element of the module is acquiring the ability to critically analyze and interpret results, as well as to present them in both written and oral forms using specialized terminology. The thematic block places a strong emphasis on developing the student's independence and creativity in the research process. Students learn how to efficiently search for and select scientific information from various sources, such as databases, scientific journals, and conference materials. They also gain knowledge about the standards of preparing a master's thesis, ensuring proper structure, presentation of results, and accuracy in citations and bibliography. An important aspect of this block is the development of soft skills, such as time and resource management, critical self-assessment, entrepreneurial thinking, and adherence to ethical principles in scientific research. Students also learn to responsibly and ethically use artificial intelligence tools in the preparation of their master's thesis, respecting academic integrity. Additionally, the block emphasizes developing skills in conducting scientific discussions, formulating arguments and counterarguments, and defending one's position. Students learn how to apply knowledge from the relevant fields and scientific disciplines of their thesis topic to effectively present and defend their viewpoints.
List of Modules Available Within the Thematic Block	Appendix 1

8. Learning Outcomes of the Thematic Block

Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
RPMT_0W01	The student knows and understands the principles of planning and conducting scientific research, including formulating research hypotheses, selecting research methods and tools, and interpreting results.	MSM_W12	3
RPMT_0W02	The student knows and understands advanced research methods and techniques relevant to the field of science related to the topic of their master's thesis.	MSM_W05	3

RPMT_0W03	The student knows and understands the principles of presenting scientific research results, particularly in the context of preparing a master's thesis, ensuring the scientific rigor and clarity of the work.	MSM_W12	3
RPMT_1U01	The student is able to independently plan and conduct scientific research related to their master's thesis topic, selecting appropriate methods and tools.	MSM_1U02 MSM_1U03 MSM_1U04	3 3 2
RPMT_1U02	The student is able to critically analyze and interpret research results, formulate conclusions, and identify the limitations of the applied research methods.	MSM_1U03	3
RPMT_1U03	The student is able to present research results both in written and oral form, using specialized terminology and adapting the presentation style to the audience.	MSM_1U07 MSM_1U08	3 3
RPMT_1U04	The student is able to effectively search for, select, and utilize scientific information necessary for conducting research, using various sources such as databases, scientific journals, and conference materials.	MSM_1U01	3
RPMT_1U05	The student is able to prepare a master's thesis in accordance with established standards, ensuring proper structure, division into chapters, presentation of research results, and accuracy of citations and bibliography.	MSM_1U08	3
RPMT_2K01	The student is prepared to responsibly manage time and resources during scientific research, demonstrating self-discipline, punctuality, and diligence in meeting planned tasks and deadlines.	MSM_1U09	3
RPMT_2K02	The student is prepared to critically evaluate their own knowledge and skills, as well as recognize the importance of expert knowledge in solving research problems.	MSM_2K01	3
RPMT_2K03	The student is prepared to think and act entrepreneurially, seeking innovative solutions to research problems.	MSM_2K04	3
RPMT_2K04	The student is prepared to adhere to ethical standards in scientific research and principles of intellectual property protection.	MSM_2K03	3
RPMT_2K05	The student is prepared to use artificial intelligence (AI) tools responsibly and ethically in the preparation of their master's thesis, respecting academic integrity and considering the limitations of these tools.	MSM_2K03	3
RPMT_2K06	The student is prepared to engage in scientific discussion, including formulating arguments, counterarguments, and defending their position, using knowledge from relevant fields of science and disciplines related to their master's thesis topic.	MSM_1U07 MSM_2K02	3 3

9. Methods of conducting classes

Code	Category	Name (description)
a03	Lecture methods / expository methods	Description *a description of objects, phenomena, processes or people; it involves specifying the structure and characteristic features of the object, phenomenon, or process being described; it is usually accompanied by a demonstration of the described object or by its models, drawings, tables, charts, etc.; a description may take the form of an explanation, classification, justification or comparison*
a05	Lecture methods / expository methods	Explanation/clarification *explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps specified by the person teaching the course*
b04	Problem-solving methods	Activating method – discussion / debate *an exchange of views supported by substantive arguments leading to a clash of different views, a compromise or the identification of common positions; it proceeds according to previously agreed-upon rules regarding the time, manner and turn-taking as well as the principles of civil discourse; a discussion is not a competition but aims at finding the best solutions*

		or presenting different points of view; its varieties include brainstorming, Oxford-style debate, panel discussion, decision tree, conference discussion; a debate is an orderly dispute between supporters and opponents of a viewpoint, usually specialists in the field or pre-selected representatives of a group dealing with a common problem
b07	Problem-solving methods	Activating methods: a case study *a comprehensive description of a phenomenon connected with the selected discipline; reflecting the reality, presenting the 'what', 'where' and 'how' of the phenomenon, i.e., all of its key aspects to be discussed in class; used as a reproduction, presentation, discussion or diagnosis of factors that shape the phenomenon or interact with it; an in-depth qualitative analysis and evaluation of a selected phenomenon*
b08	Problem-solving methods	Activating method – peer learning *learning through the exchange of knowledge in a group/team/pair of students, i.e., in the so-called learning cell; a kind of mutual learning; an approach focused on student activity under the guidance of the person teaching the course; a learning situation where students with a similar level of experience learn from one another*
b10	Problem-solving methods	SWOT analysis *a method of analyzing a phenomenon/action/work of an institution, employed to organize information and solve problems; applied in strategic planning, project implementation or solving a business or organizational problem; a universal tool to be used in the initial stage of a strategic analysis which involves sorting information about a problem into four categories: strengths and weaknesses, opportunities and threats; SWOT analysis makes it possible to determine the factors in favour of a project and its chances for success, as well as eliminating or reducing negative factors and threats to the project at the stage of early diagnosis*
c06	Demonstration methods	Demonstration-imitation *a presentation of a model way of performing specific activities accompanied by a commentary; it aims at triggering imitation activities in an individual or in a group of participants observing the activities of the person teaching the course until the right habit is formed through regular exercise; the demonstration-imitation method is combined with a physical practice of activities/behaviours*
c07	Demonstration methods	Screen presentation *a presentation of synthetic image content using computer graphics, e.g., a series of slides or other multimedia forms, usually accompanied by a commentary; typical components of a screen presentation include text organized into bulleted points, charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image*
d01	Programmed learning methods	Working with a computer *e.g., Webquest; implementation of educational tasks using electronic and digital devices, computer programs and Internet applications; the academic teacher acts as a consultant; students' work is carried out step by step according to the plan laid own by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline*
d03	Programmed learning methods	Working with another teaching tool *e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools*
e01	Practical methods	Laboratory exercise / experiment *[also conducted as fieldwork] a method of practical application of knowledge; implemented in three stages: the recognition of a problem induced by the task content, the formulation of the problem and the attempt to solve it accompanied by the assessment of the effects; the goal is to acquire skills, abilities and habits, and to consolidate the acquired knowledge so that it becomes operational; the laboratory method assumes greater independence of learners than carrying out an experiment*
f01	Methods of self-learning	Self-education *a method which involves independent acquisition of knowledge, skills and social competences, extending their scope and quality; complementary to the learning process taking place in class; taking on the task of developing and adjusting qualifications on one's own; self-study*
f03	Methods of self-learning	Conceptual work

		a (mainly intellectual) activity carried out independently (or in a selected group) resulting in the creation of a concept, idea or project; creating a plan based on a vision; developing a general outline of a project; producing a simplified sketch of the variant versions of a procedure/product/work

10. Forms of teaching

Code	Name	Number of hours	Assessment of the Learning Outcomes of the Thematic Block	Learning Outcomes of the Thematic Block	Methods of conducting classes
RP-MT_opt_1	seminar	30	course work	RPMT_0W01, RPMT_0W02, RPMT_0W03, RPMT_1U03, RPMT_1U04, RPMT_2K01, RPMT_2K05, RPMT_2K06	a03, a05, b04, b07, b08, c07, f01
RP-MT_opt_2	tutoring	140	course work	RPMT_1U01, RPMT_1U02, RPMT_1U03, RPMT_1U04, RPMT_1U05, RPMT_2K01, RPMT_2K02, RPMT_2K03, RPMT_2K04	a05, b04, b07, b10, c06, d01, d03, e01, f01, f03

11. The student's work, apart from participation in classes, includes in particular:

Code	Category	Name (description)	Is it part of the BUNA?
a01	Preparation for classes	Search for materials and review activities necessary for class participation *reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the range of activities indicated in it as required for full participation in classes*	No
a02	Preparation for classes	Literature reading / analysis of source materials *reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class*	No
a03	Preparation for classes	Developing practical skills *activities involving the repetition, refinement and consolidation of practical skills, including those developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)*	Yes
a04	Preparation for classes	Consulting materials complementary to those indicated in the syllabus *agreeing on materials complementary to those indicated in the syllabus, supporting the implementation of tasks resulting from or necessary for class participation*	Yes
a05	Preparation for classes	Production/preparation of tools, materials or documentation necessary for class participation *developing, preparing and assessing the usefulness of tools and materials (e.g. aids, scenarios, research tools, equipment, etc.) to be employed in class or as an aid when preparing for classes*	Yes
b03	Consulting the curriculum and the organization of classes	Consulting the schedule *getting acquainted with the class schedule, possibly in the presence of the year tutor, in order to optimize participation in classes, including those supplementary to the core subjects listed in the pursued study programme*	Yes
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes *devising a task implementation strategy embracing the division of content, the range of activities, implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.*	No

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/ examination completion *a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory phase/element of the verification of the learning outcomes assigned to the course*	No
d01	Consulting the results of the verification of learning outcomes	Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes *reading through the academic teacher's comments, assessments and opinions on the implementation of the task aimed at checking the level of the achieved learning outcomes*	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks *reviewing and selecting tasks and activities enabling the elimination of errors indicated by the academic teacher, their verification or correction resulting in completing the task with at least the minimum passing grade*	Yes

Details about the courses offered within the thematic block in a given academic year can be found in the Appendix 1.

This documentation has been prepared by Joanna Maszybrocka using the electronic system of the University of Silesia in Katowice, Poland.
The system provides comprehensive support for processes related to the creation, modification, and archiving of all components
of the educational program, ensuring consistency and efficiency in managing educational documentation at the university-wide level.

Within the Materials Science Ma(s)ters project, the number of hours shown for individual thematic blocks is approximate and may vary in practice,
as the courses within the blocks are flexibly shaped by instructors while maintaining the required number of ECTS credits,
where one ECTS credit corresponds to 25-30 hours of total student workload.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.