

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>	
2.	Faculty	Faculty of Science and Technology	
3.	Academic year of entry	2025/2026 (summer term)	
4.	Level of qualifications/degree	second-cycle studies	
5.	Degree profile	general academic	
6.	Mode of study	full-time	
7.	<b>General information about the module</b>		
<b>Module name</b>		<b>Computer modelling of materials structure and properties</b>	
Module code		IM2A_KMSM	
Number of the ECTS credits		4	
Language of instruction		Polish	
Purpose and description of the content of education		The module Computer modelling of materials structure and properties shall enable students learning the quantum formalism applied to numerical computations of microscopic properties of small (finite) and bulk (periodical) physical systems. Owing to that students will be prepared to use the software, available in research laboratories, for electron structure computations and thermodynamic modelling of new materials as well as to use the results to determine physical and chemical properties of materials studied and designed.	
List of modules that must be completed before starting this module (if necessary)		not applicable	
8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_KMSM_1	Knows and understands the concepts and postulates of quantum mechanics and has knowledge of quantum modeling of small systems. Has knowledge of models of the electronic structure of periodic systems: the nearly free electron model, the tight-binding approximation. Knows and understands approximate methods of quantum mechanics: perturbation theory, and the calculus of variations.	IM2A_W01 IM2A_W09	3 3
IM2A_KMSM_2	Demonstrates knowledge of the quantum description of multi-electron systems, including an understanding of the Born-Oppenheimer approximation, quantum single-particle methods (Hartree, Hartree-Fock, Thomas-Fermi), and the Hohenberg-Kohn-Sham density functional method. Familiarity with at least one software package for quantum calculations of microscopic and macroscopic properties of engineering materials.	IM2A_W01 IM2A_W09	3 3
IM2A_KMSM_3	In an understandable way students can formulate quantum mechanics definitions and postulates. They use quantum calculus for simple quantum-mechanical systems. In an understandable way they can discuss assumptions and fundamental results of basic quantum models of periodic systems electron structure.	IM2A_U01 IM2A_U08	3 3
IM2A_KMSM_4	The student can present the assumptions, capabilities, and limitations of classical and ab initio methods for modeling processes occurring in engineering materials, justify the choice of a model to solve a simple research problem. Perform classical modeling and ab initio calculations of the microscopic and macroscopic properties of engineering materials, and test the established model and interpret the calculation results using selected computational packages (WIEN2k,	IM2A_U08	3

	Quantum Espresso, LAMMPS).		
IM2A_KMSM _5	Students are aware of individual research method limitations and see the need of a thorough scientific analysis of problems in the field of materials engineering. They are aware of and know possibilities of further learning in the field of modern computer simulation methods applied to materials engineering.	IM2A_K01 IM2A_U03	3 3

**9. Methods of conducting classes**

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_KMSM_fs_1	lecture	30	exam	IM2A_KMSM_1, IM2A_KMSM_2, IM2A_KMSM_3, IM2A_KMSM_4, IM2A_KMSM_5	a01, b01, c07
IM2A_KMSM_fs_2	laboratory classes	60	course work	IM2A_KMSM_1, IM2A_KMSM_2, IM2A_KMSM_3, IM2A_KMSM_4, IM2A_KMSM_5	a05, d01, d02, f01, f02, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Computer networks and their use in materials engineering</b>
Module code	IM2A_SIECI
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	<p>The module Computer networks and their use in materials engineering shall enable that students are knowledgeable about issues of organisation, design, configuration of local computer networks; management of local networks and server resources; organisation of computer clusters for applications in materials modelling.</p> <p>Owing to that students shall achieve a better understanding of problems in the field of: computer operation in a computer network; rules and procedures for data protection on servers; organisation and management of computer clusters</p> <p>The understanding of principles and procedures for server management and network organisation shall result in deepening the skill of computer network use for information processing and in carrying out advanced parallel computations in the area of engineering materials computer modelling.</p>
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competencies (scale 1-5)
IM2A_SIECI_1	Possesses advanced knowledge of computer networks, including: network structure, classification of computer networks, the role and organization of protocols in data transmission, and the role of routing and DNS services. Understands the principles of server resource management, including managing user accounts and groups, and sharing disk resources and printers across a computer network.	IM2A_W01 IM2A_W02	3 3
IM2A_SIECI_2	He has advanced knowledge of using and managing computers running Unix. He understands the principles of building, configuring, and managing a computer cluster to support materials science research and has knowledge of programming computers operating as a computing cluster.	IM2A_W01 IM2A_W02	3 3
IM2A_SIECI_3	Can build and configure a local computer network according to given specifications and manage Windows server resources according to given specifications. Can manage resources on a Unix server. Can design and write a batch program in the Unix Bash shell environment for a specific purpose.	IM2A_U04	3
IM2A_SIECI_4	Students can implement a password-free communication (SSH) between Unix servers in a computer cluster and configure the environment for parallel computations with the use of protocol (MPI).	IM2A_U04	3

IM2A_SIECI_5	Students are aware of responsibility for own work and readiness to submit to team work rules and to bear responsibility for tasks implemented together. They understand the need to formulate and to provide information on computer networks applications in the area of materials engineering.	IM2A_K03	3
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**9. Methods of conducting classes**

Code	Category	Name (description)
a01	Lecture methods / expository methods	<b>Formal lecture/ course-related lecture</b> <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	<b>Explanation/clarification</b> <i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_SIECI_fs_1	lecture	15	course work	IM2A_SIECI_1, IM2A_SIECI_2, IM2A_SIECI_3, IM2A_SIECI_4, IM2A_SIECI_5	a01, b01, c07
IM2A_SIECI_fs_2	laboratory classes	30	course work	IM2A_SIECI_1, IM2A_SIECI_2, IM2A_SIECI_3, IM2A_SIECI_4, IM2A_SIECI_5	a05, d01, d02, f01, f02, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

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2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Dental materials</b>
Module code	IM2A_MS
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Dental materials shall enable that students are knowledgeable about physio-chemical properties of dental materials and ways of their preparation to dental applications. Owing to that students shall achieve understanding of correlations between those materials properties and their biocompatibility and also shall acquire the skill of materials selection for individual dental applications. The acquisition of this knowledge and skills shall result in preparing the student to design new materials for dental applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_MS_1	Knows a tooth structure and material constants of its structures.	IM2A_W02	3
IM2A_MS_2	Knows the physicochemical properties and methods of handling materials used for tooth prophylaxis and restoration, the production of dental crowns, removable dentures and dental implants; understands how dental materials are bonded to tooth tissues.	IM2A_W01 IM2A_W04	3 3
IM2A_MS_3	Students can critically analyse the dental materials biocompatibility.	IM2A_U03	3
IM2A_MS_4	The skill of choosing materials for production of dental crowns, removable dentures and dental implants	IM2A_U01 IM2A_U05	3 3
IM2A_MS_5	Students have a critical assessment of dental materials impact on human health.	IM2A_K01	3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification

		<i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MS_fs_1	lecture	30	exam	IM2A_MS_1, IM2A_MS_2, IM2A_MS_3, IM2A_MS_4, IM2A_MS_5	a01, b01, c07
IM2A_MS_fs_2	laboratory classes	15	course work	IM2A_MS_1, IM2A_MS_2, IM2A_MS_3, IM2A_MS_4, IM2A_MS_5	a05, d01, d02, f01, f02, 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	No

		<i>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</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

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1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
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4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
Module name	<b>Diploma laboratory 1</b>
Module code	IM2A_PD1
Number of the ECTS credits	5
Language of instruction	Polish
Purpose and description of the content of education	The module Diploma laboratory 1 shall enable students finishing activities related to the diploma thesis developing (carrying out studies, analysis and processing of study results, formulation of final conclusions). Owing to that students will be capable of independent planning and carrying out scientific research on the level of M.Sc. diploma theses.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PD1_1	The ability to conduct scientific experiments necessary to complete master's level theses in materials science	IM2A_U03 IM2A_U10 IM2A_W08 IM2A_W09 IM2A_W12	3 3 3 3 3
IM2A_PD1_2	The skill to analyse and process results of studies and to formulate final conclusions.	IM2A_K02 IM2A_U01 IM2A_U02 IM2A_U04 IM2A_W08 IM2A_W12	3 3 3 3 3 3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a05	Lecture methods / expository methods	Explanation/clarification

		<i>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</i>
d01	Programmed learning methods	Working with a computer <i>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</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PD1_fs_1	laboratory classes	60	course work	IM2A_PD1_1, IM2A_PD1_2	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

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4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Diploma laboratory 2</b>
Module code	IM2A_PD2
Number of the ECTS credits	15
Language of instruction	Polish
Purpose and description of the content of education	The module Diploma laboratory 2 shall enable students finishing activities related to the diploma thesis developing (carrying out studies, analysis and processing of study results, formulation of final conclusions). Owing to that students will be capable of independent planning and carrying out scientific research on the level of M.Sc. diploma theses.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PD2_1	The ability to conduct scientific experiments necessary to complete master's level theses in materials science	IM2A_U03 IM2A_U10 IM2A_W08 IM2A_W09 IM2A_W12	5 5 3 5 5
IM2A_PD2_2	The skill to analyse and process results of studies and to formulate final conclusions	IM2A_K02 IM2A_U01 IM2A_U02 IM2A_U03 IM2A_W08 IM2A_W12	5 5 5 5 3 5

9.	<b>Methods of conducting classes</b>		
Code	Category	Name (description)	
a05	Lecture methods / expository methods	Explanation/clarification	

		<i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d03	Programmed learning methods	Working with another teaching tool <i>e.g. using websites in any way or according to the rules set by the teacher; or making use of other subject-specific tools</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PD2_fs_1	laboratory classes	30	course work	IM2A_PD2_1, IM2A_PD2_2	a05, d01, d03, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No

c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Engineering materials</b>
Module code	IM2A_MI
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Engineering materials shall enable that students are freely knowledgeable about basic and advanced groups of engineering materials in view of the structure, properties, the way of shaping and rules of selection for specific technical products. This will allow to deepen the skill of proper choice of structural materials for specific technical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_MI_1	Students have an expanded knowledge in the field of structure and basic properties as well as of advanced groups of engineering materials useful to choose a material at manufacturing of technical products.	IM2A_W03 IM2A_W04	3 3
IM2A_MI_2	Students have the skill to compare materials mechanical, technological and operational properties and also to choose engineering materials for technical applications; they can assess economic conditions of various engineering materials use.	IM2A_U06	3
IM2A_MI_3	Students know development trends in the area of individual material groups.	IM2A_W02	3
IM2A_MI_4	Students show readiness to cooperate with designers and process engineers.	IM2A_K01 IM2A_U09	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution</i>

		<i>to the issues presented in the lecture as well as the indication of the consequences of the proposed solution</i>
c07	Demonstration methods	Screen presentation <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MI_fs_1	lecture	45	course work	IM2A_MI_1, IM2A_MI_2, IM2A_MI_3, IM2A_MI_4	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering	
2.	Faculty	Faculty of Science and Technology	
3.	Academic year of entry	2025/2026 (summer term)	
4.	Level of qualifications/degree	second-cycle studies	
5.	Degree profile	general academic	
6.	Mode of study	full-time	
7.	General information about the module		
Module name		Engineering materials designing and manufacturing	
Module code		IM2A_PIWMI	
Number of the ECTS credits		4	
Language of instruction		Polish	
Purpose and description of the content of education		The module Engineering materials designing and manufacturing shall enable that students acquire knowledge about all aspects of engineering materials manufacturing and processing and about those materials quality control methods and their manufacturing methods. Owing to that students shall acquire the skill of proper designing structural materials structure, taking into account obtaining products of required properties.	
List of modules that must be completed before starting this module (if necessary)		not applicable	
8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PIWMI_1	Students have knowledge about criteria for materials selection for technical applications as well as thermodynamic, kinetic and structural aspects of engineering materials manufacturing and processing.	IM2A_W01 IM2A_W02	3 3
IM2A_PIWMI_2	Students have detailed knowledge about materials quality control and their manufacturing methods as well as know economic and ecological aspects of material technologies designing.	IM2A_W04	3
IM2A_PIWMI_3	Students have skills of designing engineering materials and technological processes of materials manufacturing, processing and recycling.	IM2A_U05	3
IM2A_PIWMI_4	Students show readiness to cooperate with designers and process engineers.	IM2A_K01	3
9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>	

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PIWMI_fs_1	lecture	30	exam	IM2A_PIWMI_1, IM2A_PIWMI_2, IM2A_PIWMI_3, IM2A_PIWMI_4	a01, b01, c07
IM2A_PIWMI_fs_2	laboratory classes	30	course work	IM2A_PIWMI_1, IM2A_PIWMI_2, IM2A_PIWMI_3, IM2A_PIWMI_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source</i>	No

		<i>materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
Module name	<b>Engineering materials structure and properties forming</b>
Module code	IM2A_KSIWM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Engineering materials structure and properties forming shall enable that students are knowledgeable about ways to influence materials functional properties by structure changes caused by means of appropriate technological treatments. Owing to that students shall achieve a better understanding of relationships between structural materials properties and their internal structure. The understanding of those issues shall result in acquiring the skill to choose the right technological process to obtain a specific structure and properties of materials.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_KSIWM_1	Students have knowledge about the internal and external factors' influence on materials structure and properties useful to give those materials specific functional properties.	IM2A_W03 IM2A_W04	3 3
IM2A_KSIWM_2	Students have detailed knowledge about certain integrated technological processes for materials treatment	IM2A_W05	3
IM2A_KSIWM_3	Students can shape materials structure and properties by choosing a relevant technological process, using for that also computer technique applications.	IM2A_U02 IM2A_U03 IM2A_W04	3 3 3
IM2A_KSIWM_4	Students are aware of the importance and understand the impact of materials internal structure forming technology on the possibility to obtain products of specified or new functional properties.	IM2A_K01	3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_KSIWM_fs_1	lecture	15	exam	IM2A_KSIWM_1, IM2A_KSIWM_2, IM2A_KSIWM_3, IM2A_KSIWM_4	a01, b01, c07
IM2A_KSIWM_fs_2	laboratory classes	30	course work	IM2A_KSIWM_1, IM2A_KSIWM_2, IM2A_KSIWM_3, IM2A_KSIWM_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Foreign language</b>
Module code	IM2A_JO
Number of the ECTS credits	2
Language of instruction	English
Purpose and description of the content of education	The module is aimed at developing language communication competence in the field of language activities (reading, listening, speaking, writing, interacting) taking into account necessary language strategies. The module contains elements of education in the field of specialised language in the subject area and also develops the skill of independent learning, acquiring the knowledge as well as of team work and effective communication with the surroundings.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_JO_1	Students understand the meaning of main topics of the message comprised by clear standard texts on general subjects and in short specialised texts on materials engineering	IM2A_U11	3
IM2A_JO_2	Students understand the meaning of main topics of a oral message on general subjects and specialised subjects on materials engineering	IM2A_U11	3
IM2A_JO_3	Students formulate written statements on general subjects and specialised subjects on materials engineering	IM2A_U11	3
IM2A_JO_4	Students formulate speeches on general subjects and specialised subjects on materials engineering, trying to use basic rules of speech organisation	IM2A_U11	3
IM2A_JO_5	Students communicate in typical communication situations on general topics and on specialised ones on materials engineering	IM2A_U11	3
IM2A_JO_6	Students understand the need for further learning, perform self-assessment, are capable of supplementing and improving the acquired knowledge and skills	IM2A_U11	3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture

		<i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_JO_fs_1	practical classes	30	course work	IM2A_JO_1, IM2A_JO_2, IM2A_JO_3, IM2A_JO_4, IM2A_JO_5, IM2A_JO_6	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes	No

		<i>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.</i>	
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering	
2.	Faculty	Faculty of Science and Technology	
3.	Academic year of entry	2025/2026 (summer term)	
4.	Level of qualifications/degree	second-cycle studies	
5.	Degree profile	general academic	
6.	Mode of study	full-time	
7.	General information about the module		
Module name		Humanist module	
Module code		IM2A_MH	
Number of the ECTS credits		3	
Language of instruction		Polish	
Purpose and description of the content of education		The student selects the module ( s ) of the University-wide for the specific field of study. The aim of the module is to broaden the knowledge, skills and social competence of the students in the discipline unrelated to the field of study .	
List of modules that must be completed before starting this module (if necessary)		not applicable	
8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_MH_1	It has a deeper knowledge of selected scientific methods and know the discipline unrelated to the field of study	IM2A_W12	3
IM2A_MH_2	It has the ability deeper to analyze problems in the field of disciplines unrelated to the field of study	IM2A_U07	3
IM2A_MH_3	He understands the need for an interdisciplinary approach to problem solving, to integrate knowledge from different disciplines and importance of self-study.	IM2A_K01 IM2A_U10	3 3
9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture <i>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</i>	
c07	Demonstration methods	Screen presentation <i>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</i>	

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MH_fs_1	lecture	30	course work	IM2A_MH_1, IM2A_MH_2, IM2A_MH_3	a01, b01, c07
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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Implants and artificial organs</b>
Module code	IM2A_ISN
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Implants and artificial organs shall enable that students are knowledgeable about physio-chemical and mechanical aspects related to implants and artificial organs application in medicine and veterinary medicine. Owing to that students shall achieve understanding of correlations between the construction of implants and artificial organs and possibilities of their shaping and specific conditions of their operation together with limitations. The understanding of those relationships shall result in deepening the knowledge of rules for implants and artificial organs designing for specific applications in medicine and veterinary medicine.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_ISN_1	DUnderstanding physio-chemical and mechanical phenomena necessary for the operation and creation of new artificial organs and implants, learning the classification and principles of implants and artificial organs operation with respect to application needs in human and animal organisms. Understanding the methodology for designing and principles of implants and artificial organs application in medicine and veterinary medicine	IM2A_W02 IM2A_W03 IM2A_W04	3 3 3
IM2A_ISN_2	The skill of designing implants and artificial organs properties for medical applications	IM2A_U02 IM2A_U05	3 3
IM2A_ISN_3	Development of the awareness of the need to use and to choose appropriately implants and artificial organs in medicine	IM2A_K01 IM2A_K04	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_ISN_fs_1	lecture	30	exam	IM2A_ISN_1, IM2A_ISN_2, IM2A_ISN_3	a01, b01, c07
IM2A_ISN_fs_2	laboratory classes	15	course work	IM2A_ISN_1, IM2A_ISN_2, IM2A_ISN_3	a05, d01, d02, f01, f02, 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 <i>reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the</i>	No

		<i>range of activities indicated in it as required for full participation in classes</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Intellectual property protection</b>
Module code	IM2A_OWI
Number of the ECTS credits	1
Language of instruction	Polish
Purpose and description of the content of education	The module Intellectual property protection shall enable students learning the issues, regulations and legal acts related to the intellectual property, including the chronology of patent procedure and the rules of preparing documentation for invention and utility design applications. Learning the national and international bodies granting the property rights. Students will learn trademarks binding in the European Union and instruments of intellectual property protection.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_OWI_1	Increasing the knowledge about legislation in force in Poland on the intellectual property protection; understanding terms and principles from the field of intellectual property protection; knowledge of trademarks binding in the European Union; understanding and applying instruments of intellectual property protection; knowledge of national and international bodies granting the property rights.	IM2A_W10	3
IM2A_OWI_2	Students understand the chronology of patent procedure and rules to prepare documentation of invention and utility design applications.	IM2A_W10	3
IM2A_OWI_3	Students are capable of preparing patent documentation, can use basic legislation related to the intellectual property protection.	IM2A_U08	3
IM2A_OWI_4	Students are aware of the importance of observing the professional ethics.	IM2A_K03	3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_OWI_fs_1	lecture	15	course work	IM2A_OWI_1, IM2A_OWI_2, IM2A_OWI_3, IM2A_OWI_4	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Material and product quality control techniques</b>
Module code	IM2A_TKJM
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The Materials and Products Quality Control Techniques module is designed to provide students with an understanding of the phenomena, research techniques, operating principles, and measurement equipment used in non-destructive quality control methods for detecting material defects, assessing material properties, and determining the geometric form of objects, including surface structure and defects. This module will equip students with the ability to operate quality control equipment and interpret measurement results. Understanding these phenomena and operating principles will lead to the skillful application of appropriate testing techniques for quality control of implemented design solutions, materials, and components used in the production of final products. Students will become familiar with the most commonly used non-destructive testing methods, such as visual, ultrasonic, magnetic, inductive, radiographic, acoustic, and penetrant testing, as well as methods for measuring selected geometric quantities.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_TKJM_1	Possesses knowledge of quality control methods, equipment used, defect detection and evaluation of material and product properties, use of quality standards.	IM2A_W01 IM2A_W07	3 3
IM2A_TKJM_2	Ability to operate control and measurement equipment, plan measurements and material tests; interpret results and assess measurement uncertainty.	IM2A_U02 IM2A_U03	3 3
IM2A_TKJM_3	Is aware of the limitations of measurement and control methods and sees the need for a comprehensive analysis of quality control problems.	IM2A_K01 IM2A_K03	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a</i>	

		<i>passive reception of the information provided</i>
a05	Lecture methods / expository methods	<b>Explanation/clarification</b> <i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_TKJM_fs_1	lecture	30	course work	IM2A_TKJM_1, IM2A_TKJM_2, IM2A_TKJM_3	a01, b01, c07
IM2A_TKJM_fs_2	laboratory classes	45	course work	IM2A_TKJM_1, IM2A_TKJM_2, IM2A_TKJM_3	a05, d01, d02, f01, f02, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Materials chemistry</b>
Module code	IM2A_ChM
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Materials chemistry shall enable students learning theoretical and practical issues of materials chemistry. It shall enable becoming knowledgeable about chemical phenomena used in processes of materials production and analysing changes in those processes course. Owing to that students shall acquire better understanding of chemical processes influence on materials properties. Moreover, students shall acquire the skill to analyse mechanisms affecting possibilities of chemical processes course changes. The understanding of relationships, correlations and the skill to analyse shall result in identification of proceeding processes and in modifying the learned processes by the use of chemical phenomena.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_ChM_1	In-depth theoretical and practical knowledge related to materials chemistry, including biomaterials, as well as the impact of new materials on the natural environment. Knowledge and understanding of fundamental phenomena and processes related to mass and energy conversion in the chemical industry.	IM2A_W01 IM2A_W02	3 3
IM2A_ChM_2	In-depth knowledge of processes related to the industrial transport of reagents and energy carriers in industry. Students will be introduced to the preparation of materials for chemical processes.	IM2A_W04 IM2A_W06	3 3
IM2A_ChM_3	In-depth knowledge of mixture separation methods. Knowledge of materials and substances used in selected production processes in the chemical industry. Knowledge of chemical processes that influence the relationship between chemistry and the environment, as well as the interactions of biomaterials with living organisms.	IM2A_W03 IM2A_W04	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_ChM_fs_1	lecture	30	exam	IM2A_ChM_1, IM2A_ChM_2, IM2A_ChM_3	a01, b01, c07
IM2A_ChM_fs_2	laboratory classes	30	course work	IM2A_ChM_1, IM2A_ChM_2, IM2A_ChM_3	a05, d01, d02, f01, f02, 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 <i>reviewing literature, documentation, tools and materials as well as the specifics of the syllabus and the</i>	No

		<i>range of activities indicated in it as required for full participation in classes</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Materials degradation in a biological environment</b>
Module code	IM2A_DMWŚB
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Materials degradation in a biological environment shall enable that students learn basic terms and definitions related to materials degradation, such as: biodegradation, bioreactivity or resorption, and also understanding the nature of biologically active environment action on biomaterials. The module shall ensure that students are knowledgeable about types of materials subject to biodegradation in the human body environment and factors affecting physio-chemical properties of biomaterials. The module shall also enable that students are proficient in the field of in vitro and in vivo studies to assess materials degradability, of determination of basic degradation processes mechanisms, like: corrosion (metals), dissolution (ceramics) and hydrolysis (polymers) as well as of identification of degradation products.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competencies (scale 1-5)
IM2A_DMWŚB_1	In-depth knowledge of the nomenclature and basic concepts related to the degradation of materials in the human body's environment	IM2A_W01 IM2A_W02	3 3
IM2A_DMWŚB_2	Understanding and describing a destructive action of biological environment on biomaterials and processes of materials degradation in vivo and in vitro	IM2A_W02 IM2A_W04	3 3
IM2A_DMWŚB_3	Recognising and describing the influence of time and of degradation way on selected physical and chemical properties of biomaterials	IM2A_W03 IM2A_W04	3 3
IM2A_DMWŚB_4	Development of the awareness of the need to affect the biomaterials structure to improve their functional properties	IM2A_K01 IM2A_K04 IM2A_W08	3 3 3

9. Methods of conducting classes		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_DMWŚB_fs_1	lecture	30	exam	IM2A_DMWŚB_1, IM2A_DMWŚB_2, IM2A_DMWŚB_3, IM2A_DMWŚB_4	a01, b01, c07
IM2A_DMWŚB_fs_2	laboratory classes	15	course work	IM2A_DMWŚB_1, IM2A_DMWŚB_2, IM2A_DMWŚB_3, IM2A_DMWŚB_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Materials science</b>
Module code	IM2A_NOM
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Materials science shall enable that students are knowledgeable about engineering materials structure and about phenomena and processes enabling its shaping. Owing to that students shall achieve understanding of correlations between engineering materials structure and mechanisms affecting their properties. The understanding of relationships and correlations between engineering materials properties and their structure shall result in deepening the skill to shape the structure so as to obtain designed properties of materials for technical and medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_NOM_1	Students have an extended knowledge about the structure and specific characteristics of amorphous and crystalline materials; single-crystals and polycrystals; mono- and polyphase materials; understanding relationships between the structure and properties of modern engineering materials.	IM2A_W01 IM2A_W02 IM2A_W03	3 3 3
IM2A_NOM_2	Detailed learning of phenomena, processes and mechanisms causing changes of functional properties of modern engineering materials.	IM2A_W03	3
IM2A_NOM_3	Extended skill to analyse engineering materials structure and properties as well as to choose methods for their shaping in view of specific applications.	IM2A_U03	3
IM2A_NOM_4	Further development of awareness of non-technical aspects of engineering materials used; developing a creative and logical thinking.	IM2A_K01 IM2A_K03	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a</i>

		passive reception of the information provided
b01	Problem-solving methods	Problem-based lecture <i>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</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_NOM_fs_1	lecture	30	course work	IM2A_NOM_1, IM2A_NOM_2, IM2A_NOM_3, IM2A_NOM_4	a01, b01, c07
IM2A_NOM_fs_2	practical classes	15	course work	IM2A_NOM_1, IM2A_NOM_2, IM2A_NOM_3, IM2A_NOM_4	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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</i>	No

		<i>elements of the curriculum (as preparation for class participation)</i>	
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Materials structure testing methods
Module code	IM2A_MBSM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Materials structure testing methods shall enable that students expand their knowledge about phenomena and principles of operation and design of research instruments, which are applied in advanced measuring techniques and methods used to characterise the structure and basic properties of engineering materials. Owing to that students shall master operation of scientific-research instruments and acquire the skill to interpret measurement results. The understanding of phenomena and principles of operation shall result in a skilful application of appropriate testing technique to assess materials structure and properties.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_MBSM_1	Understanding phenomena used in methods for engineering materials structure and properties description, including methods using X-ray and microscopic techniques; learning the design and operation rules of specialised scientific-research instruments.	IM2A_W02 IM2A_W03	3 3
IM2A_MBSM_2	The skill to operate specialised scientific-research instruments, to plan experiments to analyse engineering materials structure and properties, to interpret results of research and measurement errors	IM2A_U03 IM2A_U08	3 3
IM2A_MBSM_3	Students are aware of individual research method limitations and see the need for a thorough scientific analysis of problems in the field of materials engineering.	IM2A_K01	3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps</i>	

		<i>specified by the person teaching the course</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MBSM_fs_1	lecture	30	exam	IM2A_MBSM_1, IM2A_MBSM_2, IM2A_MBSM_3	a01, b01, c07
IM2A_MBSM_fs_2	laboratory classes	30	course work	IM2A_MBSM_1, IM2A_MBSM_2, IM2A_MBSM_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Methods of testing the structure and properties of materials
Module code	IM2A_MBSWM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The "Methods of Research on the Structure and Properties of Materials" module is designed to enable students to expand their knowledge of the phenomena, principles of operation, and design of research equipment used in advanced techniques and measurement methods for characterizing the fundamental properties of engineering materials. This module will enable students to master the operation of research equipment and acquire the skills to interpret measurement results. Understanding the phenomena and principles of operation will lead to the skillful application of appropriate research techniques to assess the structure and properties of materials.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_MBSWM_1	Understands the phenomena used in methods for characterizing the properties of engineering materials; knows the structure and principles of operation of specialized research equipment.	IM2A_W04 IM2A_W05 IM2A_W07	3 3 3
IM2A_MBSWM_2	Ability to operate specialized research equipment, plan experiments to analyze the properties of engineering materials; interpret research results and assess measurement errors.	IM2A_U03	3
IM2A_MBSWM_3	Is aware of the limitations of a single research method and sees the need for a comprehensive, scientific analysis of problems in the field of materials engineering.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification

		<i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MBSWM_fs_1	lecture	30	exam	IM2A_MBSWM_1, IM2A_MBSWM_2, IM2A_MBSWM_3	a01, b01, c07
IM2A_MBSWM_fs_2	laboratory classes	30	course work	IM2A_MBSWM_1, IM2A_MBSWM_2, IM2A_MBSWM_3	a05, d01, d02, f01, f02, 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	No

		<i>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</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Monographic lecture 1. Advanced numerical methods in materials modelling
Module code	IM2A_WM1_MMM
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Advanced numerical methods in materials modelling shall enable students learning issues of using a classical molecular dynamics method in simulations of physical phenomena and processes. Owing to learning specialised numerical methods used in LAMMPS and AtomEye software students shall understand benefits and limitations of a classical molecular dynamics method in testing properties and designing new materials. The accomplishment of the above objective will require learning a number of issues from the field of numerical methods used in computer simulations by the molecular mechanics method, such as: Verlet algorithms, Berendsen algorithm for temperature and pressure control of the simulated physical system, slip vector method or computation of internal stresses field used during the analysis of simulation results.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM1_MMM_1	Knowledge of numerical methods used in materials modelling based on a classical molecular dynamics.	IM2A_W01	3
IM2A_WM1_MMM_2	Knowledge of selected numerical methods used to analyse simulation results.	IM2A_W02	3
IM2A_WM1_MMM_3	The skill to use computational capabilities of LAMMPS software and AtomEye software to visualise simulation results.	IM2A_U04	3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture	

		<i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_MMM_fs_1	lecture	30	course work	IM2A_WM1_MMM_1, IM2A_WM1_MMM_2, IM2A_WM1_MMM_3	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Monographic lecture 1. Intelligent materials</b>
Module code	IM2A_WM1_SAMO
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Intelligent materials shall extend students knowledge about particular properties of materials reacting to external stimuli. It will allow becoming knowledgeable about types of intelligent materials, learning mechanisms causing appropriate material reactions and also their applications. Owing to that students shall acquire broader knowledge about modern materials.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM1_SAMO_1	Extending the knowledge about diverse modern intelligent materials, i.e. capable of reacting to external stimuli through a significant change of their properties for the required and effective response to those stimuli.	IM2A_W01	3
IM2A_WM1_SAMO_2	The skill to determine phenomena occurring in intelligent materials, with particular emphasis on their existing or potential application in practice.	IM2A_U02	3
IM2A_WM1_SAMO_3	Development of the awareness of the need to affect the structure to change materials properties.	IM2A_K01	3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation

		<i>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</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_SAMO_fs_1	lecture	30	course work	IM2A_WM1_SAMO_1, IM2A_WM1_SAMO_2, IM2A_WM1_SAMO_3	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Monographic lecture 1. IT quality support systems</b>
Module code	IM2A_WM1_ISWJ
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The IT quality support systems module is intended to enable students to become familiar with IT systems used in enterprise management, especially in the field of the quality of materials used in production processes.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_WM1_ISWJ_1	The student has knowledge of IT tools for supporting quality in the areas of production, quality control, distribution and financial planning.	IM2A_W01	3
IM2A_WM1_ISWJ_2	The student is able to use IT systems used in quality support, such as statistical tools and databases.	IM2A_U01	3
IM2A_WM1_ISWJ_3	The student is aware of the importance and understands the non-technical aspects and consequences of engineering activities, including their impact on the human body and the environment and the related responsibility for decisions made.	IM2A_K01 IM2A_K04	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture <i>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</i>	
c07	Demonstration methods	Screen presentation	

		<i>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</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_ISWJ_fs_1	lecture	30	course work	IM2A_WM1_ISWJ_1, IM2A_WM1_ISWJ_2, IM2A_WM1_ISWJ_3	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7. General information about the module	
Module name	Monographic lecture 1. Magnetic nanomaterials
Module code	IM2A_WM1_NMM
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Magnetic nanomaterials shall enable that students are knowledgeable about magnetic nanomaterials structure and about methods, phenomena, and processes enabling those materials manufacturing and properties changing. Owing to that students shall achieve a better understanding of correlations between manufacturing methods, magnetic nanomaterials structure and mechanisms affecting their properties. The understanding of relationships and correlations between those materials properties and their structure shall result in honing the skill to form materials of expected physical properties for applications in technology.
List of modules that must be completed before starting this module (if necessary)	not applicable

8. Learning outcomes of the module			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM1_NMM_1	In-depth understanding of the relationship between the structure and properties of magnetic nanomaterials, understanding the phenomena of processes that influence the change in the properties of these materials.	IM2A_W03	3
IM2A_WM1_NMM_2	Learning phenomena, processes, manufacturing methods and mechanisms responsible for changing physical properties of magnetic nanomaterials.	IM2A_W03 IM2A_W04	3 3
IM2A_WM1_NMM_3	The skill to analyse the structure and properties of magnetic nanomaterials and to select manufacturing methods of magnetic nanomaterials for technical applications.	IM2A_U02 IM2A_U03	3 3
IM2A_WM1_NMM_4	Development of the awareness of the need to produce and to affect the structure to change magnetic nanomaterials properties.	IM2A_K01	3

9. Methods of conducting classes			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_NMM_fs_1	lecture	30	course work	IM2A_WM1_NMM_1, IM2A_WM1_NMM_2, IM2A_WM1_NMM_3, IM2A_WM1_NMM_4	a01, b01, c07

11. The student's work, apart from participation in classes, includes in particular:				Is it part of the BUNA?
Code	Category	Name (description)		
a01	Preparation for classes	Search for materials and review activities necessary for class participation <i>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</i>		No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>		No
a03	Preparation for classes	Developing practical skills <i>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)</i>		No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>		No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>		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 <i>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</i>		Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>		Yes



	<i>passing grade</i>	
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Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

<b>1.</b>	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7.</b>	<b>General information about the module</b>
Module name	<b>Monographic lecture 1. Nuclear techniques in materials testing</b>
Module code	IM2A_WM1_TJB
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Nuclear techniques in materials testing shall enable students learning those nuclear physics issues, which constitute the basis for nuclear techniques applications in materials testing and also which are necessary to understand the way of analysis of obtained experimental results and nuclear research methods used in the materials science. Owing to that students shall understand the importance of nuclear techniques not only in the description of materials physio-chemical properties, but also in designing new engineering materials for technical and medical applications. The accomplishment of the above objectives will require learning a number of issues from the field of physics, solid state physics, chemistry, mathematics, numerical methods, and also of mathematical statistics.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8.</b>	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM1_TJB_1	Understanding the role and importance of nuclear spectroscopic techniques in materials testing.	IM2A_W01	3
IM2A_WM1_TJB_2	Knowledge of terms and definitions used in the description of nuclear spectroscopic methods. Understanding the terms used to describe phenomena being the basis of nuclear spectroscopic methods used in materials science with special emphasis on issues related to materials.	IM2A_W01 IM2A_W02	3 3
IM2A_WM1_TJB_3	Knowledge of the apparatus and principles of measuring Mössbauer spectra and positron lifetime spectra, as well as methods of numerical analysis of experimentally obtained data.	IM2A_W07	3
IM2A_WM1_TJB_4	The skill to analyse and interpret parameters obtained in the process of numerical processing of spectra and their application to describe selected properties of materials.	IM2A_U02 IM2A_U03	3 3
IM2A_WM1_TJB_5	The skill to describe and characterise nuclear spectroscopic methods using an understandable language, a free talk about obtained results and their interpretation.	IM2A_U08	3
IM2A_WM1_TJB_6	Development of the awareness of the importance of nuclear spectroscopic methods with particular emphasis on positron lifetime spectra and Moessbauer effect spectra in modern materials science and materials.	IM2A_K01	3

9. Methods of conducting classes		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_TJB_fs_1	tutoring	30	course work	IM2A_WM1_TJB_1, IM2A_WM1_TJB_2, IM2A_WM1_TJB_3, IM2A_WM1_TJB_4, IM2A_WM1_TJB_5, IM2A_WM1_TJB_6	a01, b01, c07

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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>a set of activities aimed at performing an assigned task, to be executed out of class, as an obligatory</i>	No

		<i>phase/element of the verification of the learning outcomes assigned to the course</i>	
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</p> <p><i>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</i></p>	Yes
d02	Consulting the results of the verification of learning outcomes	<p>Development of a corrective action plan as well as supplementary/corrective tasks</p> <p><i>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</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Monographic lecture 1. Shape memory alloys in medicine
Module code	IM2A_WM1_SMAM
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Shape memory alloys in medicine shall enable students learning the nature of phenomena classified as the shape memory effect and factors having a decisive influence on martensitic transformation reversibility and on the shape memory effect inducing in engineering materials. This knowledge is necessary to obtain the skill to design alloys for specific applications, including medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM1_SMAM_1	In-depth understanding of the nature of reversible martensitic transformation and phenomena classified as the shape memory effect occurring in metals, their alloys and polymers; learning the group of materials featuring shape memory effects.	IM2A_W02	3
IM2A_WM1_SMAM_2	Understanding ethical, economic and ecological aspects of materials designing for applications in medicine.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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,</i>

		<i>charts, images and animations, sometimes sound effects or music; a multimedia illustration of course content presented in the form of a projected image</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM1_SMAM_fs_1	lecture	30	course work	IM2A_WM1_SMAM_1, IM2A_WM1_SMAM_2	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Monographic lecture 2. Analysis of experimental data obtained in selected spectroscopic studies of materials
Module code	IM2A_WM2_ADE
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Analysis of experimental data obtained in selected spectroscopic studies of materials shall provide students with knowledge about theoretical basics of fitting by means of the least-squares method. It shall show an example of optimising software application to analyse spectroscopic data with particular emphasis on positron lifetime spectra and Moessbauer spectra.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_ADE_1	Acquiring knowledge about advanced methods of spectroscopic data analysis based on the procedure of model fitting to experimental points, in particular about the role of measurements statistics, selection of model start parameters or type of constraints and the way of obtained results verification.	IM2A_W01	3
IM2A_WM2_ADE_2	The skill of practical performance of fitting procedures in the case of selected experimental data	IM2A_U03	3
IM2A_WM2_ADE_3	Becoming aware of the need to use optimisation methods in scientific and technical research.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation

		<i>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</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_ADE_fs_1	lecture	30	course work	IM2A_WM2_ADE_1, IM2A_WM2_ADE_2, IM2A_WM2_ADE_3	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7. General information about the module	
Module name	Monographic lecture 2. Modification of biomaterials surface
Module code	IM2A_WM2_MPB
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Modification of biomaterials surface shall enable that students are knowledgeable about possibilities to improve physio-chemical-mechanical properties of the surface of materials used in medicine through their surface modification and appropriate surface engineering techniques. Owing to that students should acquire knowledge related to correlations between tissues of a living organism and a biomedical material and about possibilities to reduce interaction effects - materials corrosion, negative interaction of corrosion products with the organism. The understanding of those relationships should result in deepening the skills of materials surface structure shaping to improve their biocompatibility.
List of modules that must be completed before starting this module (if necessary)	not applicable

8. Learning outcomes of the module			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_MPB_1	A deepened, supported with theory knowledge of phenomena and processes occurring on the metallic biomaterial - living organism interface and negative effects of those phenomena.	IM2A_W04	3
IM2A_WM2_MPB_2	Learning methods for surface modification of metallic materials intended for application in medicine to improve their biocompatibility.	IM2A_W04	3

9. Methods of conducting classes			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture <i>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</i>	
c07	Demonstration methods	Screen presentation	

		<i>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</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_MPB_fs_1	lecture	30	course work	IM2A_WM2_MPB_1, IM2A_WM2_MPB_2	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Monographic lecture 2. Nanocomposites</b>
Module code	IM2A_WM2_NK
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Nanocomposites shall enable that students are knowledgeable about the conceptual basics, classification, structure, defects and properties of nanocomposites and about methods of their obtaining, testing and about applications corresponding with modern technical requirements. Students will be capable of performing a comparative analysis of nanocomposites testing methods, in particular methods based on atomic forces microscopy and scanning tunnelling microscopy. Owing to that students will be capable of selecting the material, the method of its obtaining depending on operational parameters of specific elements of equipment and also of obtaining a better understanding of correlations between nanocomposites obtaining methods, their structure and properties as well as mechanisms forming their properties. This will allow honing the skill to form nanocomposites structure and properties necessary for technical and medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_NK_1	Understanding the conceptual basis of nanocomposites composed of 1D, 2D and 3D entities (in particular carbon nanotubes); the relationship between the structural scale of materials and their properties, and methods for their research and applications.	IM2A_W01	3
IM2A_WM2_NK_2	Learning phenomena, processes, methods for nanocomposites obtaining and testing, their types and defects (in particular interphase boundaries) role in nanocomposites properties forming and learning their applications.	IM2A_W02 IM2A_W03	3 3
IM2A_WM2_NK_3	Ability to analyze the structure, properties and methods of obtaining nanocomposites and to select their type and methods of obtaining them depending on the expected properties.	IM2A_U03	3
IM2A_WM2_NK_4	Development of the awareness of the need for development of nanomaterials and their technologies based on complex objects of sub-micrometric scale and understanding related technological, environmental and general-social issues.	IM2A_K01	3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture

		<i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_NK_fs_1	lecture	30	course work	IM2A_WM2_NK_1, IM2A_WM2_NK_2, IM2A_WM2_NK_3, IM2A_WM2_NK_4	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes

d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes
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Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Monographic lecture 2. Nanomaterials in medicine</b>
Module code	IM2A_WM2_NWM
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Nanomaterials in medicine shall enable that students are knowledgeable about the classification, structure, defects and properties of nanomaterials used in medicine and about methods of their obtaining, testing and in applications corresponding with modern medicine requirements. Owing to that students will be capable of selecting the material, the method of its obtaining depending on biometric and operational parameters of specific elements of equipment and also to obtain a better understanding of correlations between bionanomaterials obtaining methods, their structure and properties as well as mechanisms forming their properties. In addition, the module will enable students familiarising with a wide range of nanomaterials medical applications and with principles of their operation. This will allow in turn honing the skill to form nanomaterials structure and properties necessary for diverse medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_NWM_1	Understanding the conceptual assumptions of the use of nanomaterials in medicine and the characteristics of their structure and properties; understanding the relationship between the structural scale of materials and their properties, and orientation in current trends in the development of nanomaterials for medical applications.	IM2A_W01 IM2A_W03	3 3
IM2A_WM2_NWM_2	The skill to evaluate basic features and possibilities of nanomaterials application in medicine.	IM2A_U03	3
IM2A_WM2_NWM_3	Development of the awareness of nanomaterials application consequences in medicine.	IM2A_K01	3

<b>9. Methods of conducting classes</b>			
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	

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_NWM_fs_1	lecture	30	course work	IM2A_WM2_NWM_1, IM2A_WM2_NWM_2, IM2A_WM2_NWM_3	a01, b01, c07

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 <i>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</i>		No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>		No
a03	Preparation for classes	Developing practical skills <i>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)</i>		No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>		No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>		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 <i>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</i>		Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>		Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Monographic lecture 2. Risk management
Module code	IM2A_WM2_ZR
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The Risk Management module aims to familiarize students with the issues of risk management, in particular the identification of threats, the assessment of the probability of occurrence of potential threats and losses, as well as the four stages of risk management: risk identification, risk measurement, risk control, risk monitoring and control.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_ZR_1	The student has advanced knowledge of risk types and their characteristic features.	IM2A_W06 IM2A_W08	3 3
IM2A_WM2_ZR_2	The student has risk assessment skills, is familiar with the general principles of risk management, and methods of operational risk management.	IM2A_U06	3
IM2A_WM2_ZR_3	The student is aware of the importance and understands the non-technical aspects and consequences of engineering activities, including their impact on the human body and the environment and the related responsibility for decisions made.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation

		<i>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</i>
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**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_ZR_fs_1	lecture	30	course work	IM2A_WM2_ZR_1, IM2A_WM2_ZR_2, IM2A_WM2_ZR_3	a01, b01, c07

**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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Monographic lecture 2. Scanning probe microscopy</b>
Module code	IM2A_WM2_MBO
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Scanning probe microscopy shall enable that students are knowledgeable about issues of scanning probe microscopy methods and techniques use in materials surface studying. To this end it will be necessary to learn a number of microscopic methods, such as: tunnelling (STM), atomic forces (AFM), magnetic forces (MFM), electrostatic forces (EFM), and Raman microscopy.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WM2_MBO_1	Knowledge of selected methods and of the structure of scanning probe microscopy equipment.	IM2A_W01	3
IM2A_WM2_MBO_2	Understanding the importance and possibilities of scanning probe microscopy methods and techniques in studies of materials surface, including biological materials.	IM2A_W02	3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WM2_MBO_fs_1	lecture	30	course work	IM2A_WM2_MBO_1, IM2A_WM2_MBO_2	a01, b01, c07
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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>M.Sc. seminar 1</b>
Module code	IM2A_SM1
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module M.Sc. seminar 1 shall enable that students are knowledgeable about the subject matter under implementation, in the materials engineering field, within M.Sc. theses under development. Owing to that students will acquire the skill of independent resolution of materials engineering issues at individual stages of the M.Sc. thesis under development.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_SM1_1	Students are capable of preparing a detailed documentation related to the project or research task implementation; they can prepare a study containing discussion of obtained results.	IM2A_U08 IM2A_U09	3 3
IM2A_SM1_2	Improved skills to gather and analyse the information based on the global scientific literature on the problem to be resolved within the thesis under development on materials engineering, to formulate the objective and to suggest ways for its accomplishment.	IM2A_U01 IM2A_U02 IM2A_W12	3 3 3
IM2A_SM1_3	The skill to plan and carry out research tasks related to the M.Sc. thesis under development.	IM2A_U06 IM2A_U08 IM2A_U10 IM2A_W12	3 3 3 3
IM2A_SM1_4	The skill to use techniques for presentation of effects obtained at individual stages of the M.Sc. thesis under development.	IM2A_U08	3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
b04	Problem-solving methods	Activating method – discussion / debate

		<p>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</p>
b05	Problem-solving methods	<p>Activating method – seminar / proseminar a seminar method; usually an oral presentation of a previously studied/diagnosed problem delivered on a forum; it aims at provoking a discussion concerning the results of research work; a type of conference, course or training session modelled on seminar classes</p>
c07	Demonstration methods	<p>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</p>
f01	Methods of self-learning	<p>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</p>
f02	Methods of self-learning	<p>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</p>
f03	Methods of self-learning	<p>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</p>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_SM1_fs_1	seminar	30	course work	IM2A_SM1_1, IM2A_SM1_2, IM2A_SM1_3, IM2A_SM1_4	b04, b05, c07, f01, f02, 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	No

		<i>developed during previous classes or new skills necessary for the implementation of subsequent elements of the curriculum (as preparation for class participation)</i>	
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>M.Sc. seminar 2</b>
Module code	IM2A_SM2
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module M.Sc. seminar 2 shall enable that students are knowledgeable about the materials engineering issues within M.Sc. theses under development. Owing to that students will acquire the skill of independent resolution of materials engineering issues through the analysis of necessary world literature, of formulating the M.Sc. thesis objective, of presenting the obtained results and of formulating the final conclusions.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_SM2_1	Deepening the knowledge of materials engineering in the field of the M.Sc. thesis under development.	IM2A_W01 IM2A_W05 IM2A_W12	5 5 5
IM2A_SM2_2	The skill to use research techniques necessary to carry out research tasks.	IM2A_U01 IM2A_U03	5 5
IM2A_SM2_3	Independent preparation and presentation of papers related to the subject-matter of M.Sc. theses under development	IM2A_U08 IM2A_U09 IM2A_U10	5 5 5
IM2A_SM2_4	Acquiring the skill to discuss the field of diploma theses under development.	IM2A_U07	5

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>

		<i>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</i>
b05	Problem-solving methods	<i>Activating method – seminar / proseminar a seminar method; usually an oral presentation of a previously studied/diagnosed problem delivered on a forum; it aims at provoking a discussion concerning the results of research work; a type of conference, course or training session modelled on seminar classes</i>
c07	Demonstration methods	<i>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</i>
f01	Methods of self-learning	<i>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</i>
f02	Methods of self-learning	<i>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</i>
f03	Methods of self-learning	<i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_SM2_fs_1	seminar	30	course work	IM2A_SM2_1, IM2A_SM2_2, IM2A_SM2_3, IM2A_SM2_4	b04, b05, c07, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No

c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Production and quality management</b>
Module code	IM2A_ZPiJ
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Production and quality management shall enable that students learn basic principles of production management and issues related to the quality management in an organisation, with special emphasis on an enterprise.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_ZPiJ_1	Students have a broadened knowledge about management, including the quality management and running a business, know principles of individual entrepreneurship creation and development.	IM2A_W01 IM2A_W10	3 3
IM2A_ZPiJ_2	Students have preparation necessary to work in an industrial environment and know the safety rules.	IM2A_W10 IM2A_W11	3 3
IM2A_ZPiJ_3	Students know principles, ways and methods of running production and service activities, and also the organisation of production and service space. They can specify logistic parameters affecting the course of production processes and services. They know and understand HR management methods and instruments.	IM2A_W10 IM2A_W11 IM2A_W12	3 3 3
IM2A_ZPiJ_4	Students are aware of importance and understand non-technical aspects and effects of engineering activities, including their influence on a human organism and environment and related responsibility for the taken decisions.	IM2A_K01 IM2A_K03	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_ZPiJ_fs_1	lecture	15	course work	IM2A_ZPiJ_1, IM2A_ZPiJ_2, IM2A_ZPiJ_3, IM2A_ZPiJ_4	a01, b01, c07
IM2A_ZPiJ_fs_2	practical classes	15	course work	IM2A_ZPiJ_1, IM2A_ZPiJ_2, IM2A_ZPiJ_3, IM2A_ZPiJ_4	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning	No

		<p>outcomes <i>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.</i></p>	
c03	Preparation for verification of learning outcomes	<p>Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i></p>	No
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>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</i></p>	Yes
d02	Consulting the results of the verification of learning outcomes	<p>Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>	
2.	Faculty	Faculty of Science and Technology	
3.	Academic year of entry	2025/2026 (summer term)	
4.	Level of qualifications/degree	second-cycle studies	
5.	Degree profile	general academic	
6.	Mode of study	full-time	
7.	<b>General information about the module</b>		
<b>Module name</b>		<b>Project management</b>	
Module code		IM2A_ZPrj	
Number of the ECTS credits		3	
Language of instruction		Polish	
Purpose and description of the content of education		<p>The overall objective of the module is to provide students with selected basic issues of project management and to form the skill of practical application of those methods and techniques in this field. In particular the subject area of the module covers developing students skills in the context of analysis and interpretation of basic project management aspects.</p> <p>A synthetic characteristic of the project management context (impact of organisational conditions on projects implementation success) contributes to acquiring the knowledge in the area of organisational role and functions description and to build students skill in the field of managing and cooperating in projects introducing specific changes in the organisation. Another detailed objective of the module consists of the analysis of personal project management problems (dilemmas related to building the project team identity), which consolidates students' knowledge and skills in the field of organising and managing the team (project, task etc.) work. A practical use of project tools and techniques in the context of planning and control (own project preparing) results in acquiring by students the skill to plan and manage the time in team projects and to effectively manage the entrusted human, tangible, financial and information resources to perform tasks. Through a team development of own projects students acquire also the skill of developing and effective use of interpersonal skills.</p>	
List of modules that must be completed before starting this module (if necessary)		not applicable	
8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_ZPrj_1	Students know and describe organisational roles and functions	IM2A_W10 IM2A_W11	3 3
IM2A_ZPrj_2	Students have the skill to manage and cooperate in projects introducing specific changes in the organisation.	IM2A_W10 IM2A_W12	3 3
IM2A_ZPrj_3	Students have skills of effective management of entrusted human, tangible, financial and information resources to perform tasks	IM2A_U06	3
IM2A_ZPrj_4	Students can organise and manage the work of teams (project, task etc.) and of organisations in the work environment and outside it.	IM2A_U09	3

9. Methods of conducting classes		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_ZPrj_fs_1	lecture	30	course work	IM2A_ZPrj_1, IM2A_ZPrj_2, IM2A_ZPrj_3, IM2A_ZPrj_4	a01, b01, c07
IM2A_ZPrj_fs_3	practical classes	15	course work	IM2A_ZPrj_1, IM2A_ZPrj_2, IM2A_ZPrj_3, IM2A_ZPrj_4	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials	No

		<i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Research laboratory management</b>
Module code	IM2A_ZLB
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The Research Laboratory Management module is intended to enable students to learn the basic principles of laboratory management, occupational health and safety in laboratories and issues related to the accreditation of research laboratories.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_ZLB_1	The student has expanded knowledge of research laboratory management, including standards and accreditation requirements.	IM2A_W01 IM2A_W10 IM2A_W12	3 3 3
IM2A_ZLB_2	The student has the necessary preparation to work in a research laboratory and knows the safety rules.	IM2A_W10	3
IM2A_ZLB_3	The student knows the principles and methods of running a research laboratory, knows and understands the methods and tools for managing laboratory personnel.	IM2A_W10	3
IM2A_ZLB_4	The student is aware of the importance and understands the non-technical aspects and consequences of engineering activities, including their impact on the human body and the environment and the related responsibility for decisions made.	IM2A_K01 IM2A_K04	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture <i>an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution</i>	

		<i>to the issues presented in the lecture as well as the indication of the consequences of the proposed solution</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_ZLB_fs_1	lecture	30	course work	IM2A_ZLB_1, IM2A_ZLB_2, IM2A_ZLB_3, IM2A_ZLB_4	a01, b01, c07
IM2A_ZLB_fs_2	practical classes	15	course work	IM2A_ZLB_1, IM2A_ZLB_2, IM2A_ZLB_3, IM2A_ZLB_4	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes	No

		<i>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.</i>	
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Selected issues from biomaterials toxicology
Module code	IM2A_WZTB
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Selected issues from biomaterials toxicology shall enable that students learn issues related to biomaterials toxicology, including terms and definitions such as: toxin (poison), toxicity, degrees of toxicity, types of intoxications, adsorption of toxic substances and biocorrosion. The module shall ensure that students are knowledgeable about toxic action mechanisms and dynamics, based on which students shall understand the importance of biomaterials toxicity and its adverse effects of impact on the organism. The accomplishment of the above objectives will require learning a number of issues from the scope of the first level of education.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_WZTB_1	Knows the definitions of terms in the field of toxicology of biomaterials.	IM2A_W04	3
IM2A_WZTB_2	Skills of distinguishing and describing mechanisms of toxic action and of metabolic and morphological disorders caused by poisons. Recognising and describing infections, carcinogenic and allergic reaction of a living organism to an implant.	IM2A_U05	3
IM2A_WZTB_3	Improving skills of acquiring knew knowledge from the field of toxicological legal requirements for biomaterials binding in the European Union.	IM2A_U05 IM2A_U06	3 3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>

b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_WZTB_fs_1	lecture	30	exam	IM2A_WZTB_1, IM2A_WZTB_2, IM2A_WZTB_3	a01, b01, c07
IM2A_WZTB_fs_2	practical classes	15	course work	IM2A_WZTB_1, IM2A_WZTB_2, IM2A_WZTB_3	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>devising a task implementation strategy embracing the division of content, the range of activities,</i>	No

		<i>implementation time and/or the method(s) of obtaining the necessary materials and tools, etc.</i>	
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Social module</b>
Module code	IM2A_MSP
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The student selects the module ( s ) of the University-wide for the specific field of study. The aim of the module is to broaden the knowledge, skills and social competence of the students in the discipline unrelated to the field of study .
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_MSP_1	Has in-depth knowledge of selected scientific methods and knows issues specific to a scientific discipline unrelated to the field of study	IM2A_W12	3
IM2A_MSP_2	It has the ability deeper to analyze problems in the field of disciplines unrelated to the field of study	IM2A_U07	3
IM2A_MSP_3	He understands the need for an interdisciplinary approach to problem solving, to integrate knowledge from different disciplines and importance of self-study.	IM2A_K01 IM2A_U10	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture <i>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</i>	
c07	Demonstration methods	Screen presentation <i>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</i>	

			<i>the form of a projected image</i>		
<b>10. Forms of teaching</b>					
<b>Code</b>	<b>Name</b>	<b>Number of hours</b>	<b>Assessment of the learning outcomes of the module</b>	<b>Learning outcomes of the module</b>	<b>Methods of conducting classes</b>
IM2A_MSP_fs_1	lecture	30	course work	IM2A_MSP_1, IM2A_MSP_2, IM2A_MSP_3	a01, b01, c07
<b>11. The student's work, apart from participation in classes, includes in particular:</b>					
<b>Code</b>	<b>Category</b>	<b>Name (description)</b>			<b>Is it part of the BUNA?</b>
a01	Preparation for classes	Search for materials and review activities necessary for class participation <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Solid state physics</b>
Module code	IM2A_FCS
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Solid state physics shall enable that students learn a theoretical description of material properties and their relation to basic laws of nature. Listeners should master the scope of knowledge related to materials electron structure, thermal properties, magnetism and magnetic and dielectric properties, transport phenomena and others. A special emphasis will be placed on mastering certain computational techniques, the analysis of used approximations and of obtained results
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_FCS_1	Understands the relationship between material properties and fundamental laws of nature. In-depth knowledge of the theoretical determination of material properties (specific heat, susceptibility, etc.). Analysis of various types of computational approximations. In-depth knowledge of the electronic structure of materials, magnetism, dielectric properties, and others.	IM2A_W01 IM2A_W02	3 3
IM2A_FCS_2	The ability to solve theoretical problems related to calculating material properties. The ability to apply specific calculation methods and approximations. The analysis of various approaches to the theoretical determination of material properties.	IM2A_U01 IM2A_U02	3 3
IM2A_FCS_3	Development of the skill of new knowledge acquisition, problem analysis, concluding based on mathematical equations, acquiring the skill to interpret ideas and concepts.	IM2A_U03 IM2A_U10	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
b04	Problem-solving methods	<b>Activating method – discussion / debate</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_FCS_fs_1	lecture	30	exam	IM2A_FCS_1, IM2A_FCS_2, IM2A_FCS_3	a01, b01, c07
IM2A_FCS_fs_2	practical classes	30	course work	IM2A_FCS_1, IM2A_FCS_2, IM2A_FCS_3	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning	No

		<p>outcomes <i>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.</i></p>	
c03	Preparation for verification of learning outcomes	<p>Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i></p>	No
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>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</i></p>	Yes
d02	Consulting the results of the verification of learning outcomes	<p>Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 1. Metallic biomaterials
Module code	IM2A_PS1_BM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Metallic biomaterials provides students with a full knowledge about physical and chemical processes occurring on the metal - tissue interface, structure and properties as well as application possibilities of metallic biomaterials. Owing to that students shall achieve understanding of the specific nature of conditions to be met by metallic materials typical for those applied in medicine and veterinary medicine. The understanding of those relationships shall result in acquiring the skill to select, from individual metallic biomaterials, a material satisfying conditions of specific applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS1_BM_1	Students have knowledge about reactions and effects of living organisms interaction with metals and their alloys	IM2A_W04	3
IM2A_PS1_BM_2	Obtaining a detailed knowledge about physical, chemical and mechanical properties of metallic biomaterials and possibilities of their application for short- and long-term medical implants and surgical instruments	IM2A_U02	3
IM2A_PS1_BM_3	Students can show application possibilities for metallic nanocrystalline materials	IM2A_U01 IM2A_U03	3 3
IM2A_PS1_BM_4	Students are aware of consequences of metallic biomaterials improper use for production of implants and surgical instruments	IM2A_K01	3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_BM_fs_1	lecture	30	course work	IM2A_PS1_BM_1, IM2A_PS1_BM_2, IM2A_PS1_BM_3, IM2A_PS1_BM_4	a01, b01, c07
IM2A_PS1_BM_fs_2	laboratory classes	15	course work	IM2A_PS1_BM_1, IM2A_PS1_BM_2, IM2A_PS1_BM_3, IM2A_PS1_BM_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 1. Phase transitions in amorphous and nanocrystalline materials
Module code	IM2A_PS1_PFAN
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Phase transitions in amorphous and nanocrystalline materials shall enable students classifying phase transitions and understanding, interpreting and analysing phenomena related to phase transitions and their influence on properties of amorphous and nanocrystalline materials. Owing to that students will be capable of reconstructing, explaining, planning and using technologies utilising phase transitions in amorphous and nanocrystalline materials. They will have a possibility to adapt the existing and to design new technologies.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS1_PFAN_1	Understanding phenomena of phase transitions, interpreting relationships between the structure and phase transitions, analysing and explaining processes affecting phase transitions.	IM2A_W01 IM2A_W03	3 3
IM2A_PS1_PFAN_2	The skill to analyse phase transitions and to select methods for forming, in respect of phase transitions, materials for technical applications.	IM2A_U02 IM2A_U03	3 3
IM2A_PS1_PFAN_3	Development of the awareness of the need to model and form materials in respect of phase transitions.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_PFAN_fs_1	lecture	30	course work	IM2A_PS1_PFAN_1, IM2A_PS1_PFAN_2, IM2A_PS1_PFAN_3	a01, b01, c07
IM2A_PS1_PFAN_fs_2	laboratory classes	15	course work	IM2A_PS1_PFAN_1, IM2A_PS1_PFAN_2, IM2A_PS1_PFAN_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	<p>Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i></p>	No
a03	Preparation for classes	<p>Developing practical skills <i>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)</i></p>	No
c01	Preparation for verification of learning outcomes	<p>Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i></p>	No
c03	Preparation for verification of learning outcomes	<p>Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i></p>	No
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>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</i></p>	Yes
d03	Consulting the results of the verification of learning outcomes	<p>Review of internship documentation <i>an analysis of the portfolio of documentation obtained during internship, including professional internship, and other practical classes and studio sessions, as well as the documentation developed in order to obtain credit for such classes; verification of the description, necessary attachments, opinions and grades before submitting the portfolio for acceptance</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 1. Review of programming languages used in materials engineering
Module code	IM2A_PS1_PJP
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Review of programming languages used in materials engineering shall enable students repeating, systematising and developing the knowledge about programming languages (Basic for EXCEL spreadsheets, Pascal on the Delphi platform, Fortran), which may be applied to process the experimental data, ab initio computations or computer simulations carried out within the 'Computer materials modelling' specialisation.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS1_PJP_1	Systematisation of knowledge about advanced computer programming. The skill to apply programming to computer simulations, advanced development of experiments and ab initio computations.	IM2A_W09	3
IM2A_PS1_PJP_2	The skill of practical use of programming languages consisting in understanding the code of scientific computer programs, their modification and creation of own computational codes.	IM2A_U04	3
IM2A_PS1_PJP_3	Becoming aware of the programming languages importance in developing programming tools supporting research in science and technology.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_PJP_fs_1	lecture	30	course work	IM2A_PS1_PJP_1, IM2A_PS1_PJP_2, IM2A_PS1_PJP_3	a01, b01, c07
IM2A_PS1_PJP_fs_2	laboratory classes	15	course work	IM2A_PS1_PJP_1, IM2A_PS1_PJP_2, IM2A_PS1_PJP_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials	No

		<i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 1. Shape memory alloys
Module code	IM2A_PS1_SMA
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Shape memory alloys shall enable students learning the nature of phenomena classified as the shape memory effect and factors having a decisive influence on martensitic transformation reversibility and on the shape memory effect inducing in alloys. This knowledge is necessary to obtain the skill to design alloys for specific applications, including medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS1_SMA_1	Understanding of the nature of reversible martensitic transformation and phenomena classified as the shape memory effect occurring in metals, their alloys and polymers; learning the group of materials featuring shape memory effects.	IM2A_W01 IM2A_W02	3 3
IM2A_PS1_SMA_2	The skill to design material properties on account of shape memory effects occurrence.	IM2A_U03 IM2A_U05	3 3
IM2A_PS1_SMA_3	Understanding ethical, economic and ecological aspects of designing materials with shape memory effects for applications in medicine.	IM2A_K01 IM2A_W04	3 3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_SMA_fs_1	lecture	30	course work	IM2A_PS1_SMA_1, IM2A_PS1_SMA_2, IM2A_PS1_SMA_3	a01, b01, c07
IM2A_PS1_SMA_fs_2	laboratory classes	15	course work	IM2A_PS1_SMA_1, IM2A_PS1_SMA_2, IM2A_PS1_SMA_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials	No

		<i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 1. X-ray, electron, and neutron diffraction
Module code	IM2A_PS1_DREN
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module X-ray, electron, and neutron diffraction shall enable students understanding and mastering theoretical basics of engineering materials testing methods, using X-ray, electron, and neutron diffraction. Owing to that students shall achieve a better understanding of correlations between engineering materials structure and their properties. The understanding of those relationships and correlations shall result in deepening the skill to define a research problem, to choose properly research methods and analyses adequate to the engineering material type and degree of its ordering.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS1_DREN_1	Knows and understands the mathematical definitions and descriptions of the theory of scattering of X-rays, electrons and neutrons on a single electron, atom and groups of atoms, understanding the assumptions and fundamentals of the theory of kinematic and dynamic scattering of X-rays, electrons and neutrons.	IM2A_W01	3
IM2A_PS1_DREN_2	The skill to choose the structure studying methods adequate to the material type and its internal structure, proper interpretation and analysis of X-ray, electron and neutron diffraction patterns, determination of structural parameters from the analysis of various diffraction pattern types.	IM2A_U03	3
IM2A_PS1_DREN_3	The skill to apply a research technique to resolve scientific problems from the field of materials engineering.	IM2A_U08	3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification	

		<i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_DREN_fs_1	lecture	30	course work	IM2A_PS1_DREN_1, IM2A_PS1_DREN_2, IM2A_PS1_DREN_3	a01, b01, c07
IM2A_PS1_DREN_fs_3	laboratory classes	15	course work	IM2A_PS1_DREN_1, IM2A_PS1_DREN_2, IM2A_PS1_DREN_3	a05, d01, d02, f01, f02, 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	No

		<i>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</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

<b>1.</b>	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7.</b>	<b>General information about the module</b>
Module name	<b>Specialised subject 2. Basics of ab initio methods of computer materials modelling</b>
Module code	IM2A_PS2_PMA
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Basics of ab initio methods of computer materials modelling shall enable students learning modern quantum methods used in theoretical modelling of atomically ordered and disordered materials. Owing to that students will be prepared to use the software, available in research laboratories, for electron structure computations and thermodynamic modelling of new materials as well as to use the results to determine physical and chemical properties of materials studied and designed.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8.</b>	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS2_PMA_1	Knowledge of contemporary ab initio quantum theoretical modeling methods for engineering materials. Knowledge and understanding of the principles of selecting approximations for the exchange-correlation potential, methods of modeling crystal potential, and the differences between all-electron and pseudopotential quantum modeling methods for the properties of ordered materials.	IM2A_W01 IM2A_W02 IM2A_W09	3 3 3
IM2A_PS2_PMA_2	Advanced knowledge of at least one software package for quantum calculations of microscopic and macroscopic properties of engineering materials. Knowledge of ab initio modeling methods for atomically disordered materials.	IM2A_W01	3
IM2A_PS2_PMA_3	Ability to clearly present the theoretical foundations of modern ab initio quantum computation methods and their limitations when used in materials modeling.	IM2A_U07 IM2A_U08	3 3
IM2A_PS2_PMA_4	The ability to select the appropriate ab initio calculation method for modeling to achieve a specific research goal for engineering materials (including atomically disordered ones), to practically implement these calculations and to thoroughly analyze the calculation results.	IM2A_U03	3
IM2A_PS2_PMA_5	Developing responsibility for the reliable implementation of a computational project. Deepening teamwork skills and understanding the need for systematic project work. Preparing for active participation in team project implementation.	IM2A_K03 IM2A_U09	3 3

9. Methods of conducting classes					
Code	Category	Name (description)			
a01	Lecture methods / expository methods	<p>Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i></p>			
a05	Lecture methods / expository methods	<p>Explanation/clarification <i>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</i></p>			
b01	Problem-solving methods	<p>Problem-based lecture <i>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</i></p>			
c07	Demonstration methods	<p>Screen presentation <i>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</i></p>			
d01	Programmed learning methods	<p>Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i></p>			
d02	Programmed learning methods	<p>Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i></p>			
f01	Methods of self-learning	<p>Self-education <i>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</i></p>			
f02	Methods of self-learning	<p>Individual work with a text <i>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</i></p>			
f03	Methods of self-learning	<p>Conceptual work <i>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</i></p>			

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_PMA_fs_1	lecture	30	exam	IM2A_PS2_PMA_1, IM2A_PS2_PMA_2, IM2A_PS2_PMA_3, IM2A_PS2_PMA_4,	a01, b01, c07

				IM2A_PS2_PMA_5	
IM2A_PS2_PMA_fs_2	laboratory classes	30	course work	IM2A_PS2_PMA_1, IM2A_PS2_PMA_2, IM2A_PS2_PMA_3, IM2A_PS2_PMA_4, IM2A_PS2_PMA_5	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 2. Ceramic and polymer materials in medicine
Module code	IM2A_PS2_MCP
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Ceramic and polymer materials in medicine shall enable students achieving competence in the field of physical and practical properties of ceramic and polymer materials and in choosing ceramic and polymer materials for medical applications as well as acquiring skills to assess and examine a real structure and selected practical properties of ceramic and polymer materials.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS2_MCP_1	Understanding the characteristics of ceramic and polymer materials used in medicine and the ability to recall them when identifying the material type. In-depth knowledge of the structural structure, properties, and manufacturing methods of these materials.	IM2A_W01 IM2A_W02 IM2A_W03	3 3 3
IM2A_PS2_MCP_2	Mastering the skill to assess and examine a real structure and selected practical properties of ceramic and polymer materials used in medicine.	IM2A_U02 IM2A_U03	3 3
IM2A_PS2_MCP_3	Developing the awareness of the need for development of technology for ceramic and polymer materials used in medicine.	IM2A_K01 IM2A_K02	3 3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_MCP_fs_1	lecture	30	exam	IM2A_PS2_MCP_1, IM2A_PS2_MCP_2, IM2A_PS2_MCP_3	a01, b01, c07
IM2A_PS2_MCP_fs_2	laboratory classes	30	course work	IM2A_PS2_MCP_1, IM2A_PS2_MCP_2, IM2A_PS2_MCP_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 2. Implants of alloys featuring shape memory effect
Module code	IM2A_PS2_ISME
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Implants of alloys featuring shape memory effect shall enable that students are knowledgeable about alloys featuring shape memory effect and showing features of a biocompatible material and which may be used for medical implants. Moreover, the learning of examples of implants used so far shall enable mastering principles of their designing useful to develop new applications in medicine and veterinary medicine.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS2_ISME_1	Detailed learning of alloys featuring shape memory effect and examples of implants used so far in medicine and veterinary medicine necessary to design new implant models; understanding the designing methodology and principles of applying alloys featuring shape memory effect to implants and instruments in medicine and veterinary medicine.	IM2A_W01 IM2A_W02 IM2A_W05	3 3 3
IM2A_PS2_ISME_2	The skill to choose the alloy for an implant of specific designation; the skill to design implants and instruments applying alloys featuring shape memory effect;	IM2A_U05	3
IM2A_PS2_ISME_3	Understanding ethical, economic and ecological aspects of materials designing for applications in medicine	IM2A_K01 IM2A_K04	3 3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>	

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_ISME_fs_1	lecture	30	exam	IM2A_PS2_ISME_1, IM2A_PS2_ISME_2, IM2A_PS2_ISME_3	a01, b01, c07
IM2A_PS2_ISME_fs_2	laboratory classes	30	course work	IM2A_PS2_ISME_1, IM2A_PS2_ISME_2, IM2A_PS2_ISME_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 2. Metallic glasses and nanomaterials
Module code	IM2A_PS2_SMN
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Metallic glasses and nanomaterials shall enable that students are knowledgeable about the structure of metallic glasses and nanomaterials as well as about methods, phenomena, and processes enabling changes of such materials properties. Owing to that students shall achieve a better understanding of correlations between those materials structure and mechanisms affecting their properties. The understanding of relationships and correlations between properties of metallic glasses and nanomaterials and their structure shall result in honing the skill to shape the properties for technical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS2_SMN_1	In-depth knowledge of the relationship between the structure and properties of metallic glasses and nanomaterials, understanding the phenomena and processes affecting the properties of these materials.	IM2A_W03	3
IM2A_PS2_SMN_2	In-depth understanding of phenomena, processes, methods of shaping metallic glasses and nanomaterials, and mechanisms responsible for changing physical properties.	IM2A_W02 IM2A_W03	3 3
IM2A_PS2_SMN_3	The skill to analyse properties of metallic glasses and nanomaterials and to choose methods for those materials structure and properties forming for technical applications.	IM2A_U03 IM2A_U04	3 3
IM2A_PS2_SMN_4	Development of the awareness of the need to affect the structure to change properties of metallic glasses and nanomaterials.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_SMN_fs_1	lecture	30	exam	IM2A_PS2_SMN_1, IM2A_PS2_SMN_2, IM2A_PS2_SMN_3, IM2A_PS2_SMN_4	a01, b01, c07
IM2A_PS2_SMN_fs_2	laboratory classes	30	course work	IM2A_PS2_SMN_1, IM2A_PS2_SMN_2, IM2A_PS2_SMN_3, IM2A_PS2_SMN_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Specialised subject 2. Modern microscopic and spectral methods</b>
Module code	IM2A_PS2_MIKRS
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Modern microscopic and spectral methods shall enable that students are knowledgeable about microscopic methods for materials structure examination and also their possibilities and limitations. Students shall learn the theory of microscopic and diffraction images origination as well as of spectral methods for chemical composition determination. Owing to that students shall achieve skills of microscopic images interpretation and hence acquiring information about the structure, defects, phase and chemical composition of materials. The understanding of relationships and correlations between engineering materials properties and their structure shall result in deepening the skill to shape the structure and properties of engineering materials for technical and medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competencies (scale 1-5)
IM2A_PS2_MIKRS_1	Understanding physical and geometrical properties of electron scattering on atoms, learning the principle of electron microscopes operation, acquiring the notion of theoretical and practical resolution, understanding the notion of reciprocal lattice.	IM2A_W01 IM2A_W05	3 3
IM2A_PS2_MIKRS_2	Learning various diffraction types in electron microscopy and their use in the analysis of crystals structure.	IM2A_W02 IM2A_W05	3 3
IM2A_PS2_MIKRS_3	Understanding the origination of contrast in electron microscopy, the difference between a diffraction and phase contrast as well as principles of high-resolution image origination. Learning examples of materials testing capacities.	IM2A_W05	3
IM2A_PS2_MIKRS_4	Learning basics of spectrometry in electron microscopy and of chemical composition determination.	IM2A_W05	3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture	

		<i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	<i>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</i>
b01	Problem-solving methods	<i>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</i>
c07	Demonstration methods	<i>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</i>
d01	Programmed learning methods	<i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<i>Working with a programmed textbook working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<i>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</i>
f02	Methods of self-learning	<i>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</i>
f03	Methods of self-learning	<i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_MIKRS_fs_1	lecture	30	exam	IM2A_PS2_MIKRS_1, IM2A_PS2_MIKRS_2, IM2A_PS2_MIKRS_3, IM2A_PS2_MIKRS_4	a01, b01, c07
IM2A_PS2_MIKRS_fs_2	laboratory classes	30	course work	IM2A_PS2_MIKRS_1, IM2A_PS2_MIKRS_2, IM2A_PS2_MIKRS_3,	a05, d01, d02, f01, f02, f03

			IM2A_PS2_MIKRS_4	
11.	<b>The student's work, apart from participation in classes, includes in particular:</b>			
Code	Category	Name (description)	Is it part of the BUNA?	
a01	Preparation for classes	Search for materials and review activities necessary for class participation <i>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</i>	No	
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No	
a03	Preparation for classes	Developing practical skills <i>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)</i>	No	
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No	
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes	
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes	

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7. General information about the module	
Module name	Specialised subject 3. Advanced IT techniques in medicine
Module code	IM2A_PS3_ZIMED
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Advanced IT techniques in medicine shall enable students learning IT techniques in medicine with special emphasis on the ways of image data acquiring, processing, coding, storing, and analysing. Owing to that students shall understand the role of digital techniques in the field of medical data processing and analysing by means of statistical methods and also based on heuristic methods to support decisions in medical systems. The introduction to modelling in biology and medicine is the second issue. Students will learn basic models of population and interactions between populations.
List of modules that must be completed before starting this module (if necessary)	not applicable

8. Learning outcomes of the module			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_ZIMED_1	Learning the ways of image data acquiring, coding and storing for the needs of medicine. Learning principles of operation and the type of information delivered by selected measuring and diagnostic devices (X-ray, ultrasonograph, ECG, EEG, NMR) as well as principles of image processing; their qualitative and quantitative analysis	IM2A_W04	3
IM2A_PS3_ZIMED_2	Knows modelling methods in biology and medicine	IM2A_W04	3
IM2A_PS3_ZIMED_3	Development of the awareness of IT role in the process of medical decisions making	IM2A_K01	3

9. Methods of conducting classes			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps</i>	

		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
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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline
d02	Programmed learning methods	Working with a programmed textbook working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.
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
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 module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_ZIMED_fs_1	lecture	30	exam	IM2A_PS3_ZIMED_1, IM2A_PS3_ZIMED_2, IM2A_PS3_ZIMED_3	a01, b01, c07
IM2A_PS3_ZIMED_fs_2	laboratory classes	30	course work	IM2A_PS3_ZIMED_1, IM2A_PS3_ZIMED_2, IM2A_PS3_ZIMED_3	a05, d01, d02, f01, f02, 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	No

		<i>range of activities indicated in it as required for full participation in classes</i>	
a02	Preparation for classes	<b>Literature reading / analysis of source materials</b> <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 3. Modelling implants properties by means of FEM
Module code	IM2A_PS3_MES
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Modelling implants properties by means of FEM shall enable that students are knowledgeable about possibilities of the finite element method application to model materials for implants. Owing to that students shall achieve a better understanding of materials modelling problems and of correlations between results and the actual materials and their properties, which shall result in deepening the skill of implants shaping with the use of structure and properties of engineering materials for medical applications.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_MES_1	Understanding the finite element method (FEM) and its application to design implants; learning possibilities and limitations of the finite element method and the FEM application to simulate physical properties of implants.	IM2A_W02	3
IM2A_PS3_MES_2	The skill to analyse implants properties based on results obtained by the finite element method.	IM2A_U02	3
IM2A_PS3_MES_3	Development of the awareness of the need to model and produce implants.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture

		<i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_MES_fs_1	lecture	30	exam	IM2A_PS3_MES_1, IM2A_PS3_MES_2, IM2A_PS3_MES_3	a01, b01, c07
IM2A_PS3_MES_fs_2	laboratory classes	30	course work	IM2A_PS3_MES_1, IM2A_PS3_MES_2, IM2A_PS3_MES_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials	No

		<i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 3. Modelling of processes proceeding in engineering materials
Module code	IM2A_PS3_MODEL
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Modelling of processes proceeding in engineering materials shall show students the relationships between the knowledge about the matter properties on an atomic level and macro features of engineering materials. It comprises presentation of classical methods of molecular modelling (DM) or statistical Monte Carlo (MC) methods and shows their practical limitations. It shows an increasingly large importance of hybrid techniques, which combine modelling on a micro level with modelling of other material parts on a macro level and problems of matching the solutions at the contact of atomic and continuous areas.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_MODEL_1	Understanding the role of modelling on an atomic level in the analysis and predictions of atomic processes resulting in diffusion mixing, precipitation processes, phase transformations, materials cracking.	IM2A_W02	3
IM2A_PS3_MODEL_2	Learning assumptions, possibilities and limitations of classical techniques of molecular modelling and statistical models (Monte Carlo method); understanding limitations of classical methods and knowledge of hybrid methods assumptions	IM2A_W01	3
IM2A_PS3_MODEL_3	The skill to define assumptions, possibilities and limitations of modelling methods as well as to select a model for the set problem and expected results; the skill of independent learning complex simulation and modelling methods.	IM2A_U03 IM2A_U10	3 3
IM2A_PS3_MODEL_4	Development of the awareness of the need for modelling as the link between the basic knowledge on a micro level and materials properties on a macro level.	IM2A_K01 IM2A_K04	3 3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_MODEL_fs_1	lecture	30	exam	IM2A_PS3_MODEL_1, IM2A_PS3_MODEL_2, IM2A_PS3_MODEL_3, IM2A_PS3_MODEL_4	a01, b01, c07
IM2A_PS3_MODEL_fs_2	laboratory classes	30	course work	IM2A_PS3_MODEL_1, IM2A_PS3_MODEL_2, IM2A_PS3_MODEL_3, IM2A_PS3_MODEL_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 3. Non-magnetic nanomaterials
Module code	IM2A_PS3_NMN
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Non-magnetic nanomaterials shall enable that students are knowledgeable about non-magnetic nanomaterials structure and about methods, phenomena, and processes enabling those materials manufacturing and properties changing. Owing to that students shall achieve a better understanding of correlations between manufacturing methods, non-magnetic nanomaterials structure and mechanisms affecting their properties. The understanding of relationships and correlations between those materials properties and their structure shall result in honing the skill to form materials of expected physical properties for applications in technology.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_NMN_1	Understanding relationships between the structure and properties of non-magnetic nanomaterials, understanding phenomena of processes resulting in those materials properties changes.	IM2A_W03	3
IM2A_PS3_NMN_2	Learning phenomena, processes, manufacturing methods and mechanisms responsible for changing physical properties of non-magnetic nanomaterials.	IM2A_W01 IM2A_W02	3 3
IM2A_PS3_NMN_3	The skill to analyse the structure and properties of non-magnetic nanomaterials and to select manufacturing methods of non-magnetic nanomaterials for technical applications.	IM2A_U02	3
IM2A_PS3_NMN_4	Development of the awareness of the need to produce and to affect the structure to change non-magnetic nanomaterials properties.	IM2A_K01	3

9.	Methods of conducting classes	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>

a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_NMN_fs_1	lecture	30	exam	IM2A_PS3_NMN_1, IM2A_PS3_NMN_2, IM2A_PS3_NMN_3, IM2A_PS3_NMN_4	a01, b01, c07
IM2A_PS3_NMN_fs_2	laboratory classes	30	course work	IM2A_PS3_NMN_1, IM2A_PS3_NMN_2, IM2A_PS3_NMN_3, IM2A_PS3_NMN_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	General information about the module
Module name	Specialised subject 3. Physical methods of materials testing
Module code	IM2A_PS3_FMBM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Physical methods of materials testing shall enable students learning modern measuring techniques - the physical idea underlying a specific technique and principles of instruments operation. Students shall learn results analysis methods used for a specific method. They shall acquire the skill to select an appropriate research method for a specific problem of engineering materials characteristics determination.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_FMBM_1	Understanding operation principles of specialised instruments used to measure and analyse engineering materials properties. Understanding theoretical basics and the idea of measurement used in modern research techniques. Presenting benefits of so-called cross-experiments with the application of various measuring techniques.	IM2A_W01 IM2A_W04	3 3
IM2A_PS3_FMBM_2	Independent performance of an analysis of example measurement curves with the use of numerical analysis methods learned in other subjects. Independent selection of the analysis method for the research problem. Determination of material characteristics.	IM2A_U03	3
IM2A_PS3_FMBM_3	Development of the skill of new knowledge acquisition, problem analysis, drawing conclusions based on mathematical equations, acquiring the skill to interpret ideas and concepts.	IM2A_U10	3

9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>	

b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_FMBM_fs_1	lecture	30	exam	IM2A_PS3_FMBM_1, IM2A_PS3_FMBM_2, IM2A_PS3_FMBM_3	a01, b01, c07
IM2A_PS3_FMBM_fs_2	laboratory classes	30	course work	IM2A_PS3_FMBM_1, IM2A_PS3_FMBM_2, IM2A_PS3_FMBM_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

<b>1.</b>	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7.</b>	<b>General information about the module</b>
Module name	<b>Specialised subject 3. Testing biomaterials corrosion resistance and biocompatibility</b>
Module code	IM2A_PS3_MBOKiBB
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Testing biomaterials corrosion resistance and biocompatibility shall ensure that students learn testing methods allowing to determine the life of metallic implants in the environment of living tissues and systemic fluids in a human organism and the biomaterials biocompatibility. The module shall enable that students are knowledgeable about types of metallic biomaterials corrosion (general, pitting, crevice, stress) and about principles of the testing methodology for corrosion processes and corrosion resistance of materials for medical implants and instruments. The module shall also enable proficiency in the field of issues related to in vitro and in vivo tests for biomaterials biocompatibility assessment. The understanding of the correlation existing between the biomaterial type, its structure and surface condition and functional properties referred to applications in medicine and technology shall result in acquiring by students the skill of proper biomaterial selection for implantation, satisfying requirements of biocompatibility and of high corrosion resistance
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8.</b>	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
PS3_MBOKiBB_1	Understanding the role and importance of corrosion resistance and biocompatibility of biomaterials used in medicine and technology	IM2A_W04 IM2A_W06	3 3
PS3_MBOKiBB_2	Deepened knowledge from the field of biological environment action on biomaterials used in implantation techniques	IM2A_W04 IM2A_W08	3 3
PS3_MBOKiBB_3	The skill to apply knowledge related to operation of instruments as well as traditional and new technologies for biomaterials surface modification to obtain an effective improvement to their corrosion resistance and biocompatibility	IM2A_U02 IM2A_U04	3 3
PS3_MBOKiBB_4	The skill to define and explain, based on examples, the types and mechanisms of corrosion destruction occurring on biomaterials in contact with the living organism environment and also to recognise complications, to determine the reasons of their origination and to suggest prevention methods	IM2A_U01 IM2A_U02	3 3
PS3_MBOKiBB_5	The skill to forecast the biomaterials corrosion rate in the environment of systemic tissues and fluids based on in vitro measurements and to design medical products intended for implants and medical instruments, featuring a high corrosion	IM2A_U02	3

	resistance and biocompatibility	IM2A_U05	3
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**9. Methods of conducting classes**

Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
PS3_MBOKiBB_fs_1	lecture	30	exam	PS3_MBOKiBB_1, PS3_MBOKiBB_2,	a01, b01, c07

				PS3_MBOKiBB_3, PS3_MBOKiBB_4, PS3_MBOKiBB_5	
PS3_MBOKiBB_fs_2	laboratory classes	30	course work	PS3_MBOKiBB_1, PS3_MBOKiBB_2, PS3_MBOKiBB_3, PS3_MBOKiBB_4, PS3_MBOKiBB_5	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Specialist subject 1. Statistical process control</b>
Module code	IM2A_PS1_SSP
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The Statistical Process Control module is intended to familiarize students with a set of statistical techniques and methods used to assess process stability and with methods for preventing inconsistencies by detecting and signaling disturbances in the process.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_PS1_SSP_1	The student is able to recognize how process parameters influence product properties.	IM2A_W03 IM2A_W04	3 3
IM2A_PS1_SSP_2	The student is able to use statistical tools to maintain and improve the quality capability of processes, propose process improvement strategies using statistical process control tools.	IM2A_U03	3
IM2A_PS1_SSP_3	The student is aware of the importance and understands the non-technical aspects and consequences of engineering activities, including their impact on the human body and the environment and the related responsibility for decisions made.	IM2A_K01 IM2A_K04	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution</i>

		<i>to the issues presented in the lecture as well as the indication of the consequences of the proposed solution</i>
c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS1_SSP_fs_1	lecture	30	course work	IM2A_PS1_SSP_1, IM2A_PS1_SSP_2, IM2A_PS1_SSP_3	a01, b01, c07
IM2A_PS1_SSP_fs_2	laboratory classes	15	course work	IM2A_PS1_SSP_1, IM2A_PS1_SSP_2, IM2A_PS1_SSP_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source</i>	No

		<i>materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
Module name	<b>Specialist subject. 2. Integrated quality management systems. 1</b>
Module code	IM2A_PS2_ZSZJ1
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The Integrated Quality Management Systems 1 module aims to familiarize students with the issues of integrated management systems and standardized quality management systems.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_PS2_ZSZJ1_1	The student has advanced knowledge of the theoretical foundations of an integrated quality management system. They understand the essence and goals of standardized quality systems.	IM2A_W01 IM2A_W10	3 3
IM2A_PS2_ZSZJ1_2	The student is able to use the ISO 9000 series standards in quality management.	IM2A_U01	3
IM2A_PS2_ZSZJ1_3	The student is aware of the limitations of a single research method for the analysis of problems and understands the need for an interdisciplinary approach in the quality control process.	IM2A_K01	3

<b>9. Methods of conducting classes</b>		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>

c07	Demonstration methods	Screen presentation <i>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</i>
d01	Programmed learning methods	Working with a computer <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	Working with a programmed textbook <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>
f03	Methods of self-learning	Conceptual work <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_ZSZJ1_fs_1	lecture	30	exam	IM2A_PS2_ZSZJ1_1, IM2A_PS2_ZSZJ1_2, IM2A_PS2_ZSZJ1_3	a01, b01, c07
IM2A_PS2_ZSZJ1_fs_2	laboratory classes	30	course work	IM2A_PS2_ZSZJ1_1, IM2A_PS2_ZSZJ1_2, IM2A_PS2_ZSZJ1_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No

a03	Preparation for classes	<p>Developing practical skills <i>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)</i></p>	No
c01	Preparation for verification of learning outcomes	<p>Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i></p>	No
c03	Preparation for verification of learning outcomes	<p>Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i></p>	No
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>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</i></p>	Yes
d02	Consulting the results of the verification of learning outcomes	<p>Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Specialist subject 3. Elements of machine constructions</b>
Module code	IM2A_PS3_EBM
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The purpose of the Machine construction elements module is to familiarize students with the basic parts of machines and mechanisms, their construction, application and working conditions. The module also has the task of presenting the principles of constructing parts of machines and performing engineering calculations, as well as the method of recording structures in the form of a project.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_PS3_EBM_1	Has knowledge in the field of machine and device construction, principles of their design and engineering calculations and construction documentation.	IM2A_W01	3
IM2A_PS3_EBM_2	Has knowledge of the use of appropriate materials and technological treatments to obtain the optimal set of structural elements.	IM2A_W01 IM2A_W02	3 3
IM2A_PS3_EBM_3	He is able to obtain information from standards, catalogs and patents and to interpret and verify.	IM2A_U01	3
IM2A_PS3_EBM_4	Is able to design basic elements of machines and devices.	IM2A_U05	3
IM2A_PS3_EBM_5	He can choose construction materials and the construction element's manufacturing technique taking into account the influence of material on the operational properties of the machine and the device.	IM2A_U05 IM2A_U06	3 3
IM2A_PS3_EBM_6	He can use knowledge from other disciplines when designing machine and device elements.	IM2A_U01	3

9. Methods of conducting classes		
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
b01	Problem-solving methods	Problem-based lecture <i>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</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS3_EBM_fs_1	lecture	30	exam	IM2A_PS3_EBM_1, IM2A_PS3_EBM_2, IM2A_PS3_EBM_3, IM2A_PS3_EBM_4, IM2A_PS3_EBM_5, IM2A_PS3_EBM_6	a01, b01, c07
IM2A_PS3_EBM_fs_2	practical classes	30	course work	IM2A_PS3_EBM_1, IM2A_PS3_EBM_2, IM2A_PS3_EBM_3, IM2A_PS3_EBM_4, IM2A_PS3_EBM_5, IM2A_PS3_EBM_6	a01, b04, c07, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes



	<i>passing grade</i>	
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Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering	
2.	Faculty	Faculty of Science and Technology	
3.	Academic year of entry	2025/2026 (summer term)	
4.	Level of qualifications/degree	second-cycle studies	
5.	Degree profile	general academic	
6.	Mode of study	full-time	
7.	General information about the module		
Module name		<b>Specialist subject. 3. Integrated quality management systems 2</b>	
Module code		IM2A_PS3_ZSJ2	
Number of the ECTS credits		3	
Language of instruction		Polish	
Purpose and description of the content of education		The Integrated Quality Management Systems 2 module aims to familiarize students with the issues of environmental and occupational health and safety management systems, as well as the use of internal audits as tools for improving management systems.	
List of modules that must be completed before starting this module (if necessary)		not applicable	
8.	Learning outcomes of the module		
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_PS2_ZSJ2_1	The student will gain in-depth knowledge of the process approach to quality management, environmental management systems, and occupational health and safety. They will also understand the importance of internal audits in management systems.	IM2A_W01 IM2A_W03	3 3
IM2A_PS2_ZSJ2_2	The student is able to use the ISO 14001 and PN-N 18001 series standards in environmental and occupational health and safety management.	IM2A_U01	3
IM2A_PS2_ZSJ2_3	The student is aware of the importance and understands the non-technical aspects and consequences of engineering activities and the associated responsibility for decisions made.	IM2A_K01	3
9.	Methods of conducting classes		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
a05	Lecture methods / expository methods	Explanation/clarification <i>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</i>	
b01	Problem-solving methods	Problem-based lecture <i>an analysis of a selected scientific or practical problem accompanied by its assessment and an attempt to provide a solution</i>	

		<i>to the issues presented in the lecture as well as the indication of the consequences of the proposed solution</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_PS2_ZSZJ2_fs_1	lecture	30	exam	IM2A_PS2_ZSZJ2_1, IM2A_PS2_ZSZJ2_2, IM2A_PS2_ZSZJ2_3	a01, b01, c07
IM2A_PS2_ZSZJ2_fs_2	laboratory classes	30	course work	IM2A_PS2_ZSZJ2_1, IM2A_PS2_ZSZJ2_2, IM2A_PS2_ZSZJ2_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source</i>	No

		<i>materials to be used in class</i>	
a03	Preparation for classes	<b>Developing practical skills</b> <i>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)</i>	No
c01	Preparation for verification of learning outcomes	<b>Determining the stages of task implementation contributing to the verification of learning outcomes</b> <i>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.</i>	No
c03	Preparation for verification of learning outcomes	<b>Implementation of an individual or group assignment necessary for course/phase/examination completion</b> <i>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</i>	No
d01	Consulting the results of the verification of learning outcomes	<b>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes</b> <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	<b>Development of a corrective action plan as well as supplementary/corrective tasks</b> <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7. General information about the module</b>	
<b>Module name</b>	<b>Surface structure and its modifications</b>
Module code	IM2A_SPJM
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Surface structure and its modifications shall enable that students are knowledgeable about engineering materials surface structure, physio-chemical phenomena occurring on the interface, tribological properties as well as modification methods enabling improvement to functional properties of engineering materials; that they master modern testing methods for the structure and properties. Owing to that students shall achieve a full understanding of the structure and properties relationships between the substrate, the layer and external conditions. The understanding of those relationships shall result in acquiring the skill to shape the surface structure so as to obtain better functional properties of engineering materials required in the intended use conditions.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8. Learning outcomes of the module</b>			
Code	Description	Learning outcomes of the programme	Level of competencies (scale 1-5)
IM2A_SPJM_1	Understanding the engineering materials surface and surface layers structure; knowing phenomena and processes occurring on the material - environment interface; knowing methods for surface modification to improve functional properties of engineering materials.	IM2A_W03 IM2A_W04	3 3
IM2A_SPJM_2	Students have knowledge about modern testing methods for the structure and properties of material surface layers.	IM2A_W02 IM2A_W03	3 3
IM2A_SPJM_3	Students have the skill to choose appropriate protection methods or to improve surface properties of engineering materials.	IM2A_U03 IM2A_U04	3 3
IM2A_SPJM_4	Students have knowledge about economic and environmental aspects of surface modification.	IM2A_U06 IM2A_W06	3 3

<b>9. Methods of conducting classes</b>			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture	

		<i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	<b>Explanation/clarification</b> <i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_SPJM_fs_1	lecture	30	exam	IM2A_SPJM_1, IM2A_SPJM_2, IM2A_SPJM_3, IM2A_SPJM_4	a01, b01, c07
IM2A_SPJM_fs_2	laboratory classes	30	course work	IM2A_SPJM_1, IM2A_SPJM_2, IM2A_SPJM_3, IM2A_SPJM_4	a05, d01, d02, f01, f02, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Technical metrology</b>
Module code	IM2A_MT
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The aim of the Technical Metrology module is to provide students with a basic understanding of general metrology, with a focus on the metrology of geometric and electrical quantities. During the course, students will learn the basics of measurement error theory, methods for calculating measurement uncertainty, and the various stages of the measurement process. They will also become familiar with the structure, operation, and properties of measuring tools and instruments, including new generation computer-aided instruments. They will also acquire knowledge on documenting the measurement process in accordance with the ISO 9000 series of quality management standards. The knowledge acquired should enable them to acquire practical skills in using basic measurement equipment and the ability to correctly analyze and interpret measurement results.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_MT_1	Knowledge of metrology, measurements of basic physical and technical quantities, use of standards, metrics and measurement standards.	IM2A_W01	3
IM2A_MT_2	Ability to operate measuring equipment, plan measurements; interpret test results and assess measurement uncertainty.	IM2A_U03	3
IM2A_MT_3	Is aware of the limitations of measurement methods and sees the need for a comprehensive analysis of metrology problems.	IM2A_K01	3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	Explanation/clarification <i>explication involving the derivation of a predetermined theorem from other, already known ones, in the number of steps</i>

		<i>specified by the person teaching the course</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_MT_fs_1	lecture	30	exam	IM2A_MT_1, IM2A_MT_2, IM2A_MT_3	a01, b01, c07
IM2A_MT_fs_2	laboratory classes	60	course work	IM2A_MT_1, IM2A_MT_2, IM2A_MT_3	a05, d01, d02, f01, f02, 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 <i>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</i>	No

a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	Field of study	Materials Science and Engineering
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7. General information about the module	
Module name	Tissue engineering
Module code	IM2A_IT
Number of the ECTS credits	2
Language of instruction	Polish
Purpose and description of the content of education	The module Tissue engineering shall enable that students are knowledgeable about physiological, biological and physio-chemical aspects related to the tissue reconstruction in medicine. Owing to that students shall achieve understanding of correlations between tissues of a living organism and tissue reconstruction methods as well as possibilities to reduce effects of interactions. The understanding of those relationships shall result in deepening the skill of tissue reconstruction principles and the testing methods to control phenomena on the phase boundary on a micro- and nano-metres scale.
List of modules that must be completed before starting this module (if necessary)	not applicable

8. Learning outcomes of the module			
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_IT_1	Understanding physiological, biological and physio-chemical phenomena and processes accompanying the interaction of human tissues and their substitutes in the form of biomaterials as well as understanding methods for tissue reconstruction. Learning the testing methods and principles of tissues for reconstruction production with respect to the needs for applications in human organisms. Understanding the designing methods and principles of tissue engineering application together with methods of tissue reconstruction in medicine.	IM2A_W02 IM2A_W04	3 3
IM2A_IT_2	The skill to design properties of tissues for medical applications.	IM2A_U05	3
IM2A_IT_3	Development of social awareness with emphasis on threats and benefits of tissue engineering application in medicine.	IM2A_K02 IM2A_K04	3 3

9. Methods of conducting classes			
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>	
b01	Problem-solving methods	Problem-based lecture	

		<i>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</i>
b04	Problem-solving methods	Activating method – discussion / debate <i>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</i>
c07	Demonstration methods	Screen presentation <i>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</i>
f01	Methods of self-learning	Self-education <i>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</i>
f02	Methods of self-learning	Individual work with a text <i>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</i>

**10. Forms of teaching**

Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_IT_fs_1	lecture	15	course work	IM2A_IT_1, IM2A_IT_2, IM2A_IT_3	a01, b01, c07
IM2A_IT_fs_2	practical classes	15	course work	IM2A_IT_1, IM2A_IT_2, IM2A_IT_3	a01, b04, c07, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning	No

		<p>outcomes <i>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.</i></p>	
c03	Preparation for verification of learning outcomes	<p>Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i></p>	No
d01	Consulting the results of the verification of learning outcomes	<p>Analysis of the corrective feedback provided by the academic teacher on the results of the verification of learning outcomes <i>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</i></p>	Yes
d02	Consulting the results of the verification of learning outcomes	<p>Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i></p>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

1.	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

7.	<b>General information about the module</b>
Module name	<b>Unconventional biomaterials</b>
Module code	IM2A_NIEKON
Number of the ECTS credits	3
Language of instruction	Polish
Purpose and description of the content of education	The module Unconventional biomaterials shall extend students knowledge about biomaterials. It will allow learning about the structure of bioresorbable materials, polymer medicine carriers, bioglasses and biosensors, learning the silicones application in medicine. Owing to that students shall acquire broader knowledge of biomaterials.
List of modules that must be completed before starting this module (if necessary)	not applicable

8.	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competenc (scale 1-5)
IM2A_NIEKON_1	Has in-depth knowledge of bioresorbable materials, intelligent biomaterials, polymeric drug carriers, bioglasses and biosensors, knows the applications of silicones in medicine, knows the phenomena classified as shape memory effect and is able to demonstrate their presence in biomaterials.	IM2A_W01 IM2A_W02	3 3
IM2A_NIEKON_2	Has in-depth knowledge of biomaterials of natural origin – blood, connective tissue, bone, collagen fibers – structure and properties of collagen.	IM2A_W02 IM2A_W03	3 3
IM2A_NIEKON_3	The skill of determining methods of intelligent textile materials manufacturing and methods of collagen obtaining	IM2A_U01 IM2A_U03	3 3
IM2A_NIEKON_4	Developing awareness of the impact of engineering activities related to the production of unconventional biomaterials on the development of various areas of the economy and social life, affecting the human body and the environment. Developing awareness and developing skills and knowledge in the field of biomaterial structure design, and assuming responsibility for the decisions made.	IM2A_K02 IM2A_K04	3 3

9.	<b>Methods of conducting classes</b>	
Code	Category	Name (description)
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture <i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a</i>

		<i>passive reception of the information provided</i>
a05	Lecture methods / expository methods	<b>Explanation/clarification</b> <i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_NIEKON_fs_1	lecture	30	exam	IM2A_NIEKON_1, IM2A_NIEKON_2, IM2A_NIEKON_3, IM2A_NIEKON_4	a01, b01, c07
IM2A_NIEKON_fs_2	laboratory classes	15	course work	IM2A_NIEKON_1, IM2A_NIEKON_2, IM2A_NIEKON_3, IM2A_NIEKON_4	a05, d01, d02, f01, f02, 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 <i>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</i>	No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>	No
a03	Preparation for classes	Developing practical skills <i>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)</i>	No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>	No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>	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 <i>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</i>	Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>	Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.

<b>1.</b>	<b>Field of study</b>	<b>Materials Science and Engineering</b>
2.	Faculty	Faculty of Science and Technology
3.	Academic year of entry	2025/2026 (summer term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

<b>7.</b>	<b>General information about the module</b>
<b>Module name</b>	<b>Unconventional techniques for materials manufacturing</b>
Module code	IM2A_NTWM
Number of the ECTS credits	4
Language of instruction	Polish
Purpose and description of the content of education	The module Unconventional techniques for materials manufacturing shall enable that students are knowledgeable about methods for monocrystalline materials production and shall enable understanding mechanisms of their growth and the formation of a real structure. Owing to that and based on the analysis of phase equilibrium diagrams they will be capable of analysing the course of single-crystals growth and of predicting the chemical and phase composition as well as the kinetics of their crystallisation. These capabilities apply also to the production of complex polyphase materials monocrystalline on a macroscopic scale, including aviation monocrystalline superalloys. This module will provide students with an additional possibility to learn methods for structural perfection assessment of monocrystalline materials. Owing to that students shall achieve a better understanding of correlations between the structure of monocrystalline materials and conditions of their producing, which in turn will enable obtaining the skill to form the structure and properties of monocrystalline materials by appropriate conditions of their producing.
List of modules that must be completed before starting this module (if necessary)	not applicable

<b>8.</b>	<b>Learning outcomes of the module</b>		
Code	Description	Learning outcomes of the programme	Level of competence (scale 1-5)
IM2A_NTWM_1	Understanding the relationship between the structure and its parameters and the conditions for obtaining single crystals; understanding the phenomena of kinetic and thermal processes occurring during single crystal growth and solidification of composite materials, including those with a single crystal matrix.	IM2A_W03	3
IM2A_NTWM_2	Learning methods for producing and characterising single-crystals and composites with a single-crystal matrix as well as aviation superalloys monocrystalline on a macroscopic scale, and also phenomena, processes proceeding on the crystallisation front.	IM2A_W04	3
IM2A_NTWM_3	The skill to analyse phase diagrams in view of possibility to produce single-crystals of predetermined phase composition and the skill to choose a method for obtaining a specific material.	IM2A_U02 IM2A_U03	3 3

<b>9.</b>	<b>Methods of conducting classes</b>		
Code	Category	Name (description)	
a01	Lecture methods / expository methods	Formal lecture/ course-related lecture	

		<i>a systematic course of study involving a synthetic presentation of an academic discipline; its implementation assumes a passive reception of the information provided</i>
a05	Lecture methods / expository methods	<b>Explanation/clarification</b> <i>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</i>
b01	Problem-solving methods	<b>Problem-based lecture</b> <i>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</i>
c07	Demonstration methods	<b>Screen presentation</b> <i>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</i>
d01	Programmed learning methods	<b>Working with a computer</b> <i>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 down by the person teaching the course and following his instructions, and proceeds towards producing the indicated results within the set deadline</i>
d02	Programmed learning methods	<b>Working with a programmed textbook</b> <i>working with a textbook containing instructional material covering part of or the entire curriculum of the module as well as a formula for studying the content; includes working with a subject textbook, an atlas, a catalogue, a problem book, etc.</i>
f01	Methods of self-learning	<b>Self-education</b> <i>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</i>
f02	Methods of self-learning	<b>Individual work with a text</b> <i>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</i>
f03	Methods of self-learning	<b>Conceptual work</b> <i>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</i>

10. Forms of teaching					
Code	Name	Number of hours	Assessment of the learning outcomes of the module	Learning outcomes of the module	Methods of conducting classes
IM2A_NTWM_fs_1	lecture	30	course work	IM2A_NTWM_1, IM2A_NTWM_2, IM2A_NTWM_3	a01, b01, c07
IM2A_NTWM_fs_2	laboratory classes	45	course work	IM2A_NTWM_1, IM2A_NTWM_2, IM2A_NTWM_3	a05, d01, d02, f01, f02, 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 <i>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</i>			No
a02	Preparation for classes	Literature reading / analysis of source materials <i>reading the literature indicated in the syllabus; reviewing, organizing, analyzing and selecting source materials to be used in class</i>			No
a03	Preparation for classes	Developing practical skills <i>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)</i>			No
c01	Preparation for verification of learning outcomes	Determining the stages of task implementation contributing to the verification of learning outcomes <i>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.</i>			No
c03	Preparation for verification of learning outcomes	Implementation of an individual or group assignment necessary for course/phase/examination completion <i>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</i>			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 <i>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</i>			Yes
d02	Consulting the results of the verification of learning outcomes	Development of a corrective action plan as well as supplementary/corrective tasks <i>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</i>			Yes

Information on the details of the module implementation in a given academic year can be found in the syllabus available in the USOS system: <https://usosweb.us.edu.pl>.